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MAY 29, 1950
VOLUME 39, NO. 11

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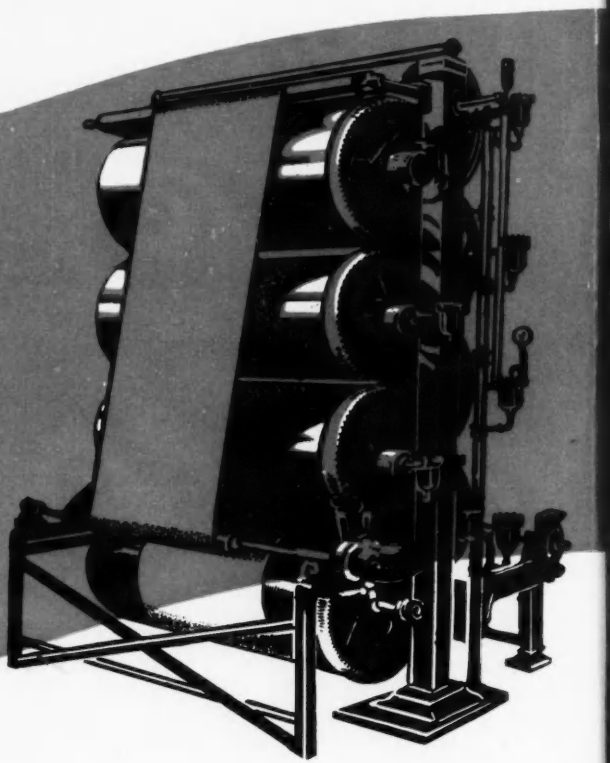

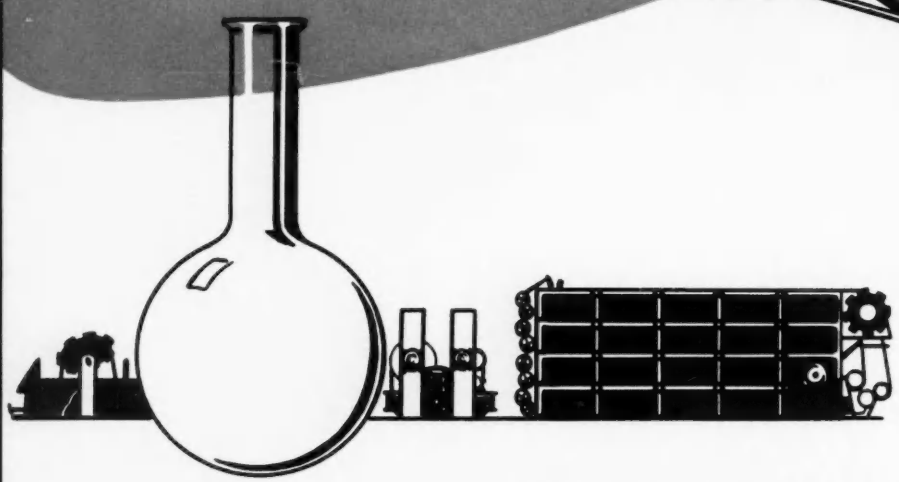

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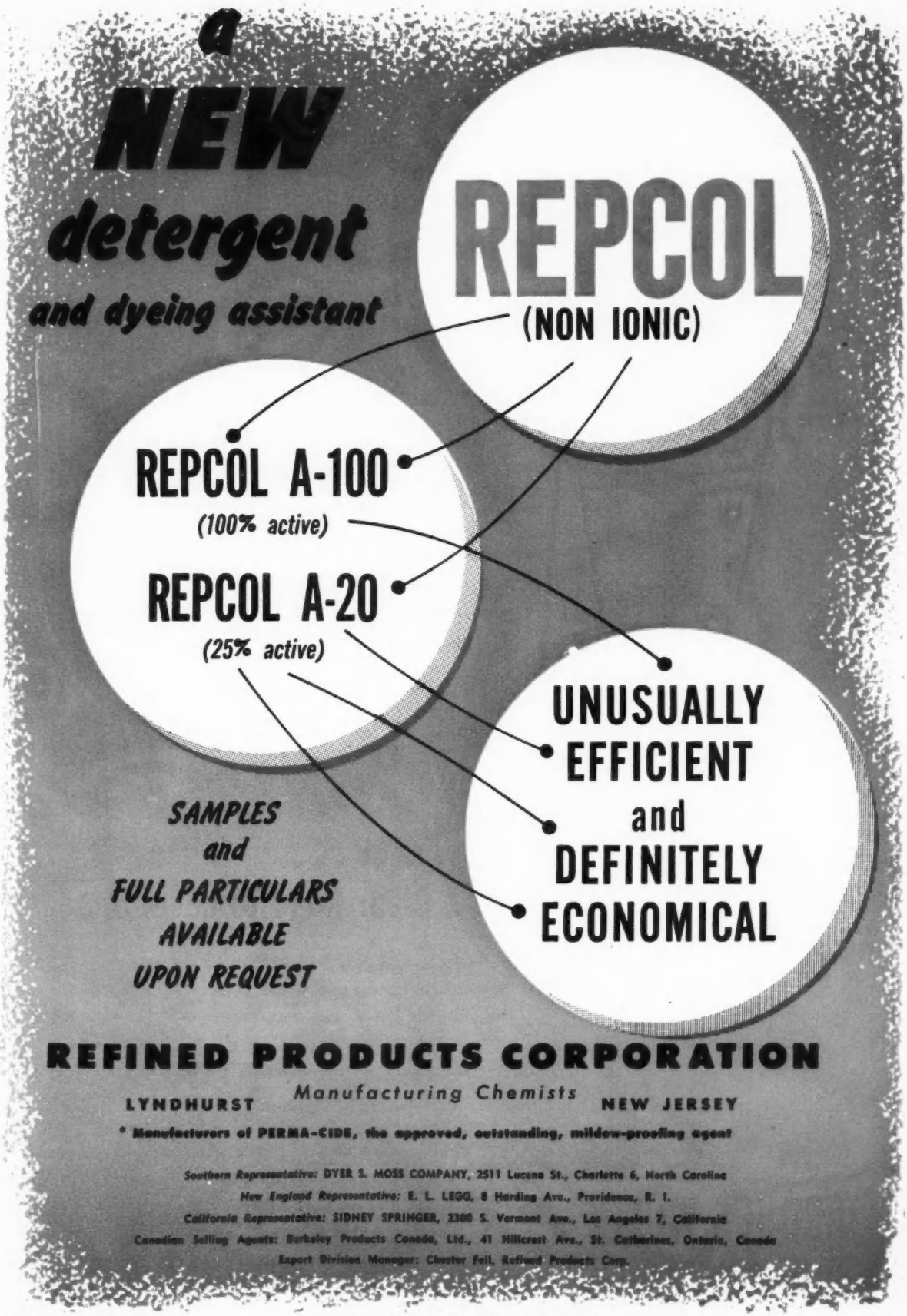
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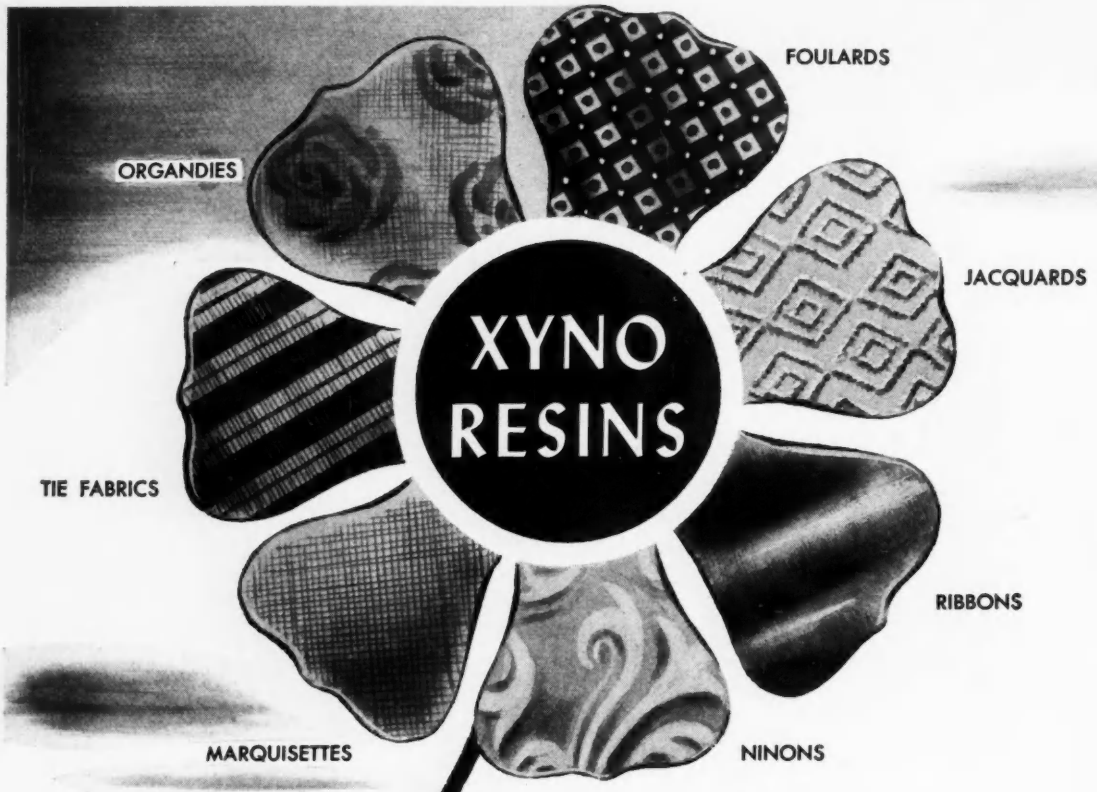

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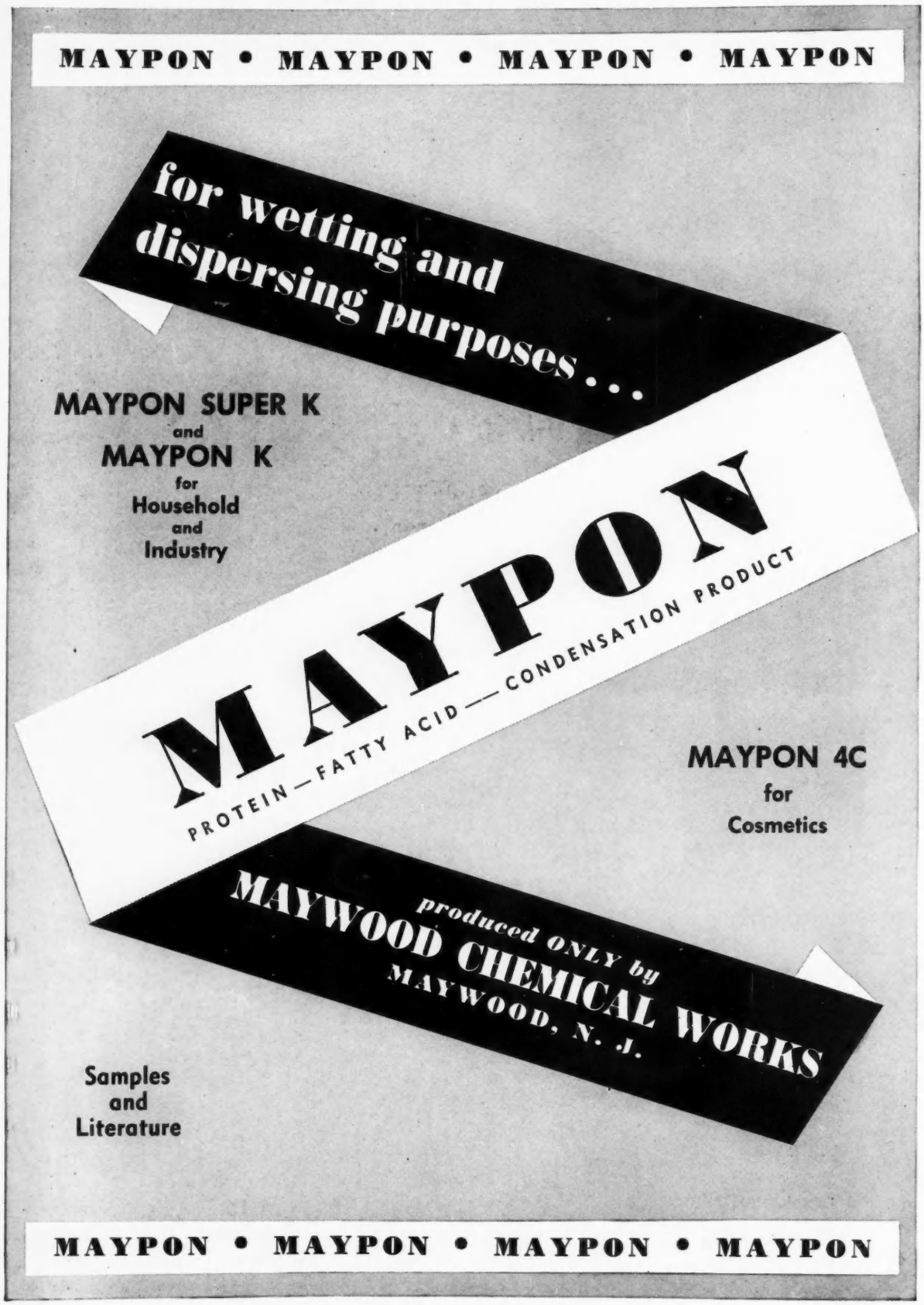
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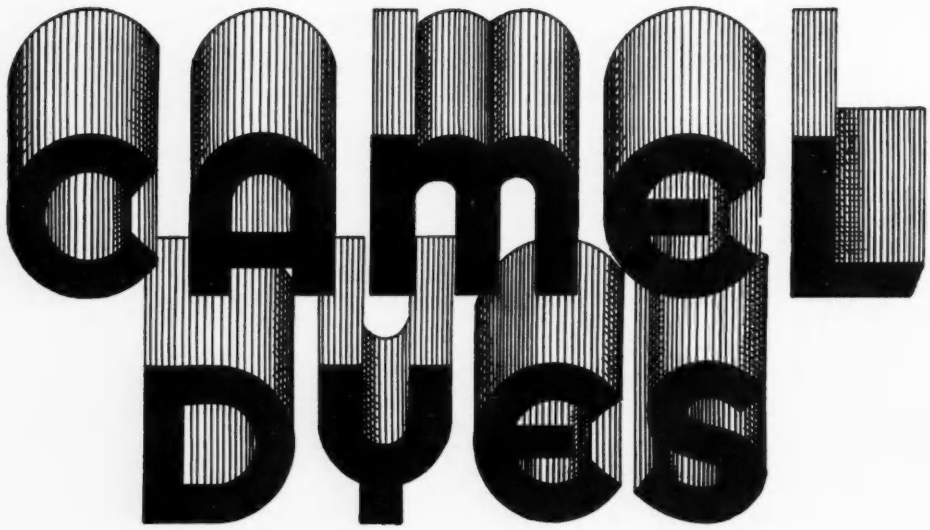

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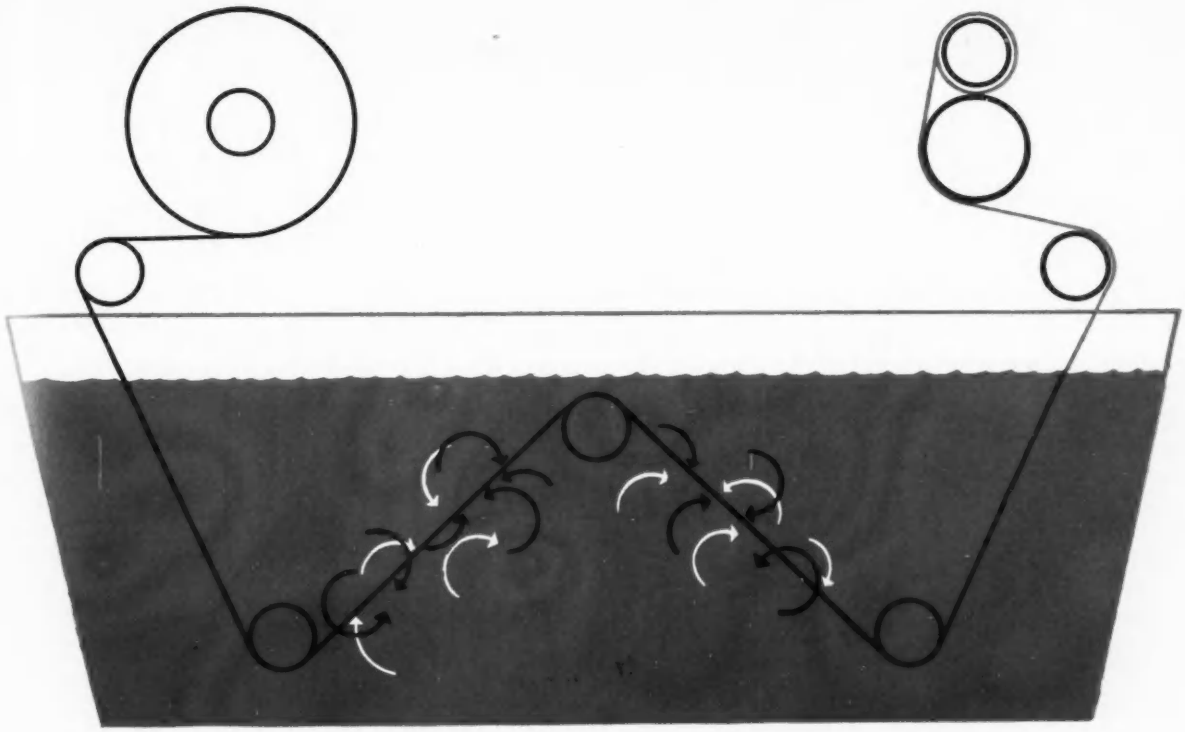

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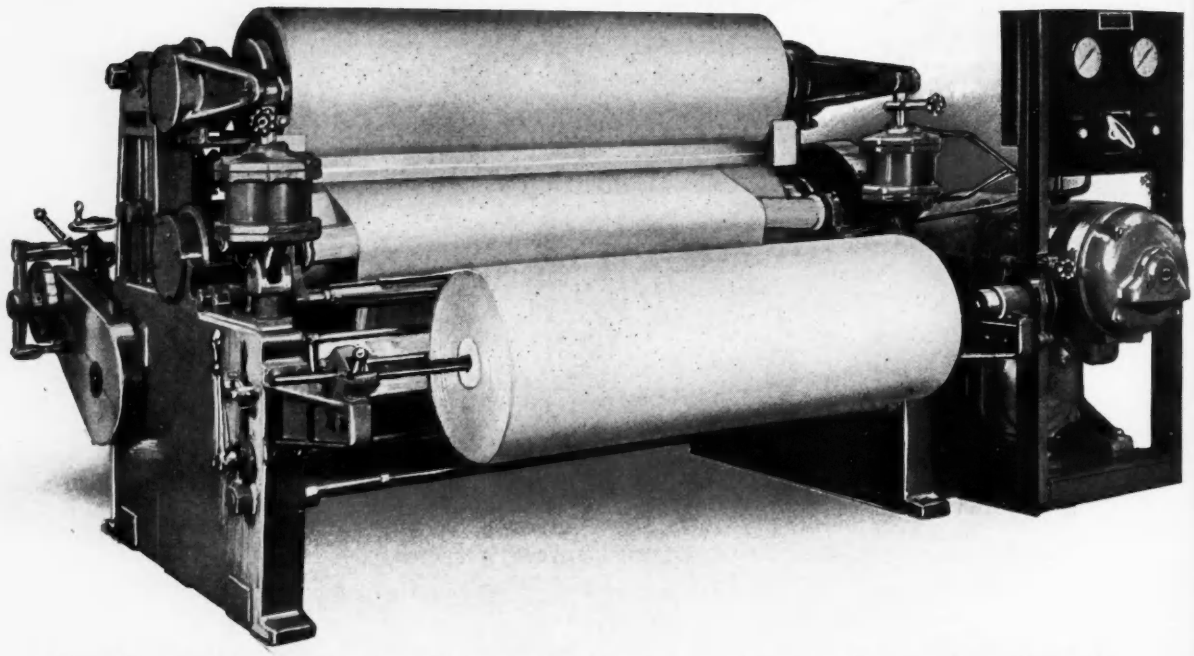

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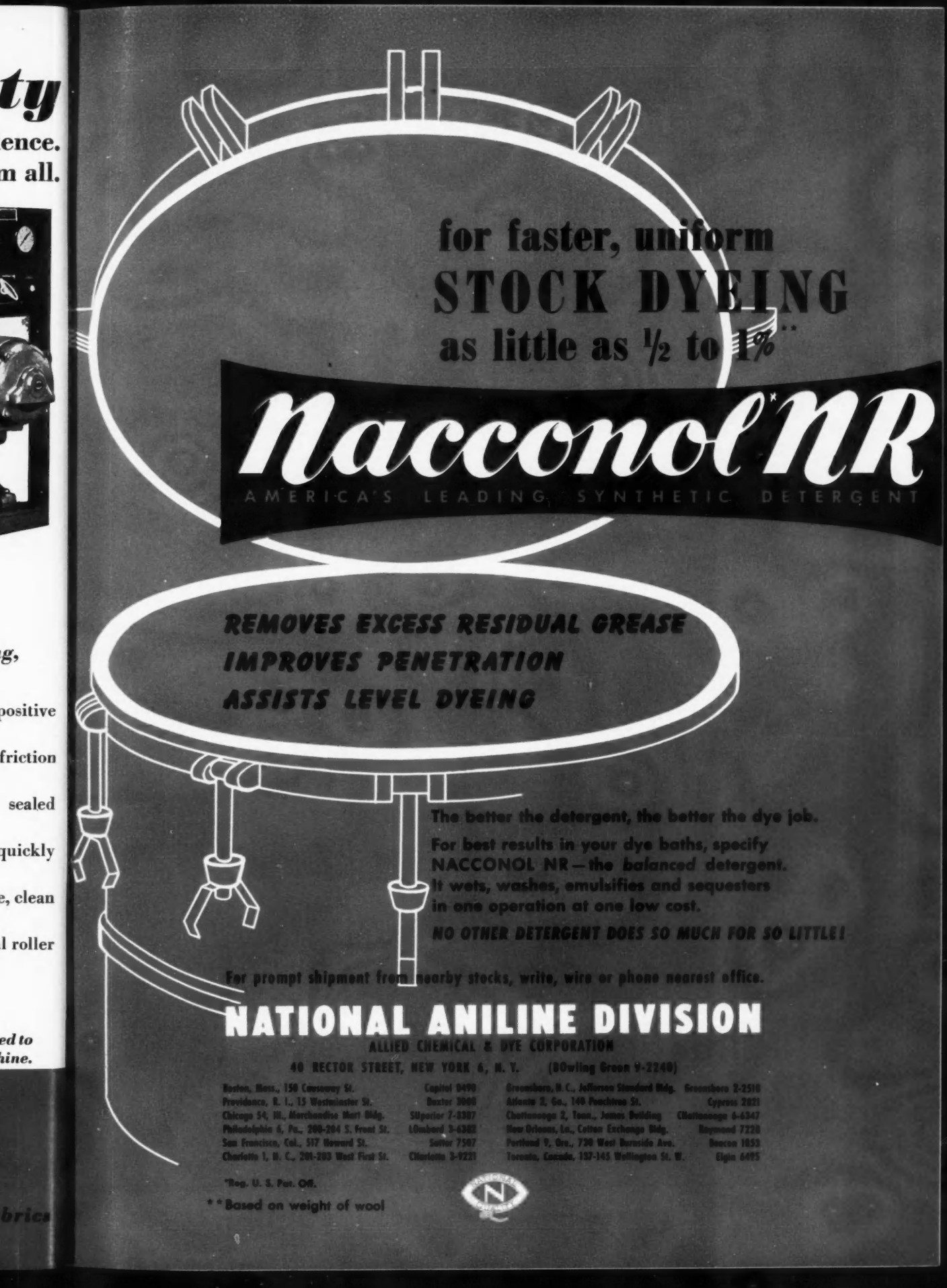
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MAY 29, 1950
VOLUME 39 NUMBER 11

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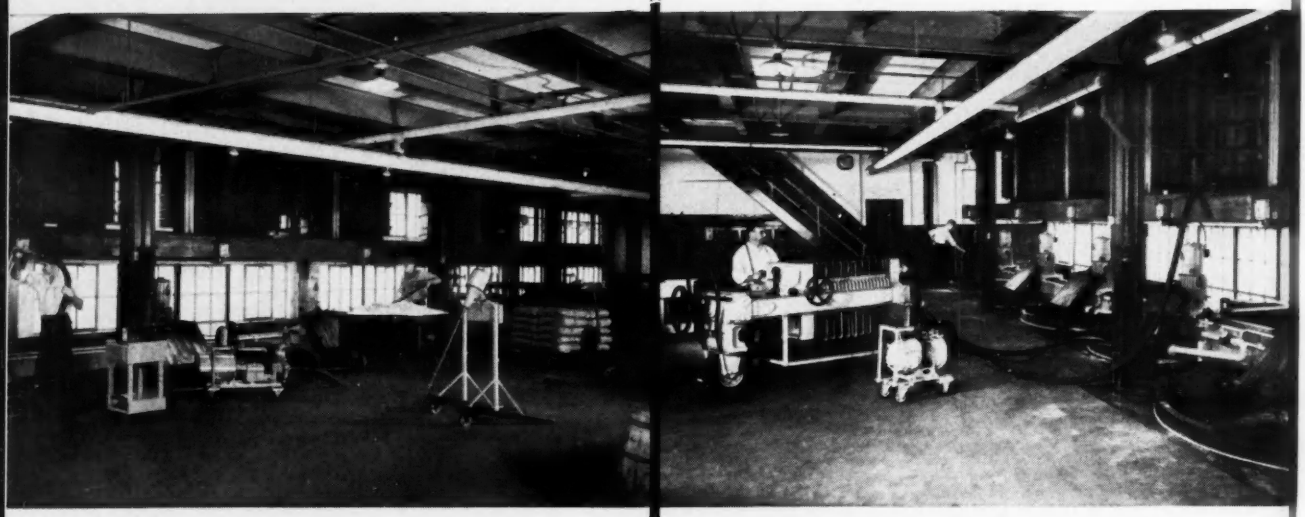

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VOLUME 39 MAY 29, 1950 NUMBER 11

THE EFFECT OF NONDURABLE ALUMINUM SALT—WAX EMULSIONS ON THE WEAR RESISTANCE OF TEXTILES*

SEAMAN J. TANENHAUS and MARY E. DARBY

Research and Development Laboratories, Philadelphia Quartermaster Depot, U. S. Army

Claims that the use of nondurable aluminum salt—wax emulsions decrease the amount of soiling and increase the serviceability of textile items have been evaluated by means of three field service tests. The conditions of these tests involved severe wear and moderately severe laundering, moderate wear and very severe laundering, and moderate wear and laundering, respectively. An auxiliary objective of this study was to ascertain whether certain laboratory tests had merit for the prediction of serviceability.

From the results obtained, it is concluded that the use of a non-durable aluminum salt—wax emulsion for increasing wear resistance is not warranted for garments subjected to severe wear or severe laundering, that the use of such compounds may be justified for fabrics subjected to moderate wear and laundering; and that field serviceability cannot be predicted by any of the laboratory tests investigated.

Introduction

A SURVEY of industrial and institutional laundries conducted in 1945 indicated that nondurable aluminum salt—wax emulsions were being utilized to some extent on the basis of manufacturer's claims that the compound decreases soilage and consequently minimizes the number of rewashes needed. This was supposed to lower the cost of laundry operations and to increase the useful life of the textile items. Since one phase of the Quartermaster Corps' project on Wear Resistance of Textiles is concerned with the effect of aftertreatments on the serviceability of Army clothing, a study was initiated to determine whether sufficient benefits accrue from the use of an aluminum salt—wax emulsion additive to warrant its inclusion in the standard Army washing formulas.

As part of the survey, a field test was initiated to determine the effect of such a finish upon the wear life of the Army fatigue uniform under conditions of actual use. At the same time, the Laboratory arranged to participate in two other field tests, the first conducted by the laundry of a large food store chain and the second supervised by an orphanage. The extent of this participation is detailed in subsequent discussions of these two tests. The same compound was employed in the military and the chain-store laundry tests and a different compound was used in the other nonmilitary test. In each case, the manufacturer's directions for the use of the additive were followed.

The three studies are described in following sections.

Field Tests

1. FORT JACKSON STUDY.—

a. *Objective:* To evaluate the effectiveness of a nondurable aluminum salt—wax emulsion treatment, applied during laundering, upon the wear resistance of the herringbone twill fatigue uniform worn in military service.

b. *Procedure:* This test was conducted under the auspices of the Quartermaster Board, Camp Lee, Virginia. Each test subject was fitted with two sets of jackets and trousers. One set of garments was treated with the wax emulsion; the other was untreated. The test subjects, who were members of recruit training companies at Fort Jackson, South Carolina, wore the garments during those periods of their basic training for which the fatigue uniform was normally required. For the first week, half the men wore the treated uniform, the others wearing the untreated. During the second week, the men who had worn the treated garments wore the untreated sets, and vice versa. This alternation was repeated for the duration of

TABLE I
Laundry Formula E—Fort Jackson Study

Operation	Water, In.	Time, Min.	Temp., °F.	Supplies
1. Suds	5	7	130	Alkali and Soap
2. Suds	5	10	140	Soap stock solution
3. Suds	5	10	140	Soap stock solution
4. Suds	5	10	140	Soap stock solution
5. Rinse #1	12	3	140	None
6. Rinse #2	12	3	120	None
7. Rinse #3	12	3	100	None
8. Sour	5	5	Tap	Sour
	Total	51		

Note: For the treated garments, the formula was modified by the addition of a 1% aluminum salt—wax emulsion in the last operation.

* This material has been released for public information by the Office of Technical Services, U. S. Department of Commerce. Textile Series Report No. 36.

TABLE II
Effect of Treatment on Wear of Fatigue Uniforms

	Jackets		Trousers	
	U	T	U	T
Garments withdrawn because of unserviceability, (No.)	124	124	129	123
Weeks of wear (avg.)	20.5	21.3	18.1	18.3
Wear score, cum.	33.2	34.7	39.7	40.1
Wear index	1.62	1.63	2.19	2.19

the test.

Two hundred uniforms of each group were issued initially. After the first recruit training company had finished its basic training, the garments were collected and reissued to a newly formed company. This procedure was repeated until approximately seventy percent of the original garments had to be removed from the test as being unserviceable in the opinion of the official scorers. The test was terminated after 58 weeks of wear.

After each week of wear, the garments were laundered, examined and scored in accordance with the system developed by the Quartermaster Board for evaluating wear resistance of garments subjected to the Combat Course. In essence, this system evaluates the wear of a garment by means of weighted scores based on the number and size or severity of holes and abraded areas. Fortuitous rips and tears are not scored, but are repaired. Although the assigned scores are arbitrary, a high correlation has been found between the scores of garments tested on the Combat Course and garments worn in actual service.

Laundry Formula E, modified in the case of the treated garments by the addition of a one percent emulsion during the final operation, was used. This formula, used on fast colors (heavy soil) is detailed in Table I.

c. *Results:* For each type of garment (jackets and trousers, treated and untreated), records were maintained of (1) the number removed from the test weekly because of unserviceability; (2) the average number of weeks of wear prior to removal; (3) the average cumulative wear score; and (4) the Wear Index, which is the ratio of the average cumulative wear score to the average number of weeks of wear. These data are summarized in Table II. Of the two hundred uniforms of each type originally issued, approximately twenty were lost. The loss of ten percent is not unusual when it is considered that four successive training companies and two years of elapsed time were involved, with attendant transfers and normal attrition of personnel.

The weekly average cumulative wear scores are plotted against the wearing time of the trousers and jackets in Figure 1. The approximate parallelism of these curves indicates that the paths of degradation for the treated and the untreated garments are practically identical. Further indication of the lack of effect of the treatment on the wear resistance of the fatigue uniform is evident from the similarity of the frequency distributions when the percentages of garments removed from the test are plotted (1) against the number of weeks of wear before removal (Figure 2) and (2) against the cumulative wear score at the time of removal (Figure 3).

d. *Conclusions:* Analysis of the data shows that under conditions of severe wear and laundering operations, the aluminum salt—wax emulsion did not enhance the wear resistance of the Army fatigue uniform.

2. RETAIL FOOD STORE STUDY.—

a. *Objective:* To evaluate the effectiveness of a nondurable aluminum salt—wax emulsion treatment, applied during laundering, upon the wear resistance of service-type garments subjected to normal wear in food stores.

b. *Procedure:* This test was conducted by the laundry of a company operating a large chain of retail food stores. The Quartermaster Corps participated in this test to the extent of performing sample analyses in its laboratories and sending its personnel to the laundry plant at periodic intervals for inspection of the garments in test.

Two super-markets were selected for the test on the basis of similarities in volume and type of business (groceries, produce, and meats). Approximately four hundred each of smocks (6.7 oz. cotton drill) and hoovers (5.1 oz. cotton sheeting) were used. Each lot of garments was divided into two equal groups, the control items, which were washed by the laundry's standard procedure, and the test garments, which were washed by the same method except for the addition of a one percent non-durable aluminum salt—wax emulsion compound. The two groups were identified by distinctively colored braids. The specimens were issued randomly to the employees. During a given week, any garment in use was worn by the same individual, but no particular person wore any particular item throughout the test. The garments in service were washed at the end of the week, the formula (Table III) being the one normally used by the laundry. The wax emulsion was added in the concentration recommended by its manufacturer.

Holes and tears were mended when necessary. All garments, except those re-

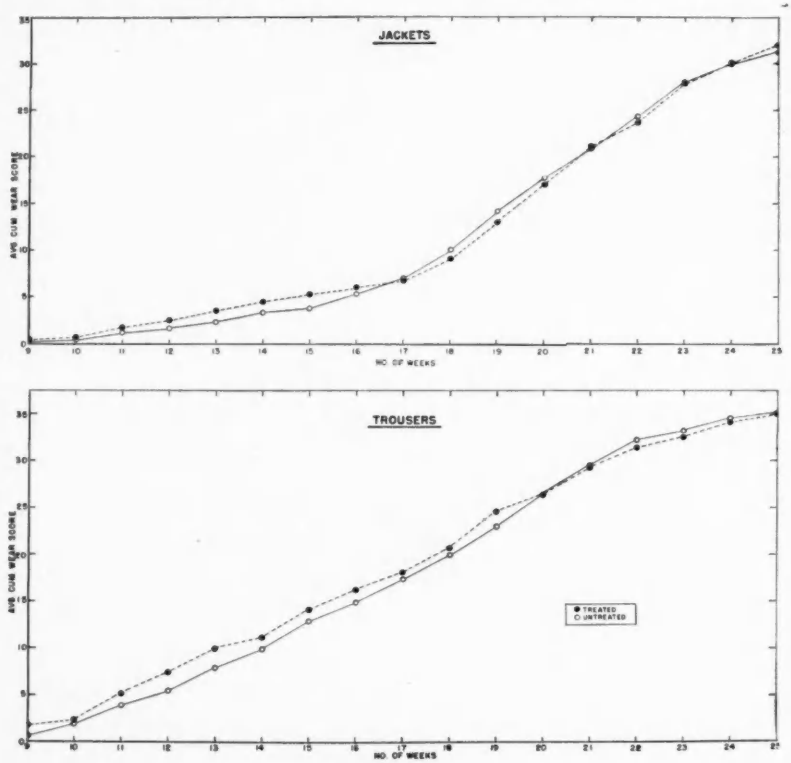

Figure 1
Comparison of Wear of Wax Treated & Untreated HBT Garments at Fort Jackson

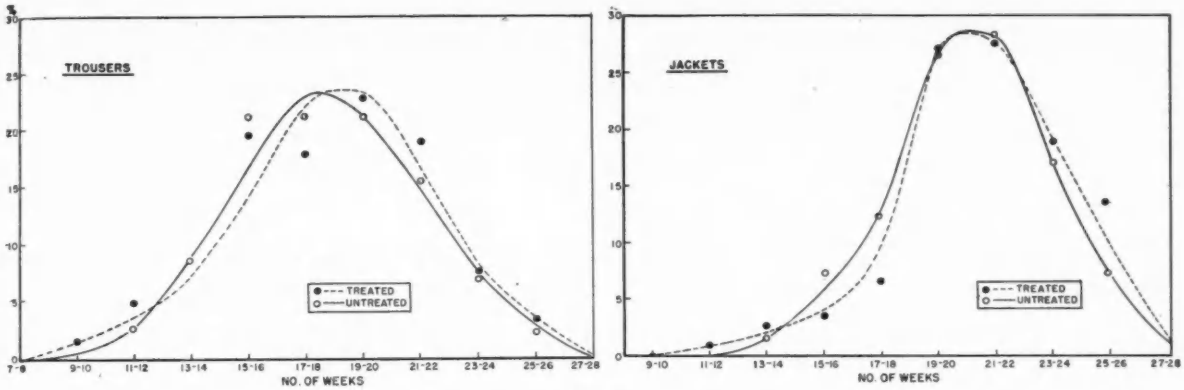

Figure 2

Percent of Treated & Untreated Garments Removed from Test at the End of Increasing Time Periods

moved for laboratory evaluation, were worn until unserviceable, this point being ascertained during routine inspection.

Randomly selected garments of each type (hoovers and smocks, both treated and untreated) were withdrawn after 5, 20, 35, 45, and 55 weeks of wear, respectively, and submitted to the Philadelphia Quartermaster Research and Development Laboratory for analysis in order to determine whether the use of this treatment affected various fabric and yarn characteristics. An observer from the Laboratory visited the plant at the 35th, 45th, and 55th week in order to evaluate visually the in-service garments available at that time.

c. *Results:* Because of the nature of this test, it was impracticable to keep records similar to those kept in the Fort Jackson study, i.e., data as to cumulative wear scores and weeks of wear undergone by the garments before being withdrawn from the test because of unserviceability. The data presented are the results of visual examination at three stages (Table IV) and of laboratory analysis for certain fabric and yarn properties at five pre-selected stages of the study (Tables V and VI).

TABLE III

Formula of Food Store Laundry

Operation	*Water, In.*	*Time, Min.*	*Hot Water*	*Cold Water*	*Steam*	*Temp., °F.*
1. Flush	6	5½	...	x	...	90
2. Alkali + soap	5	9	...	x	...	100
3. Soap	4	11	x	x	...	120
4. Soap	5	8	x	...	x	155
5. Bleach	4	12	x	...	x	167
6. Rinse #1	8	4	x	...	...	168
7. Rinse #2	8	5	x	...	...	171
8. Rinse #3	10	3	x	x	...	125
9. Rinse #4	10	3	x	x	...	120
10. Rinse #5	10	3	...	x	...	95
11. Sour	10	1½	...	x	...	85
12. Blue	10	3½	...	x	...	85
13. Starch	2	3	...	x	...	85
* Treatment, 1%	2	8	...	x	...	90
	Total	79¼				

* Omitted for control garments.

(1) *Visual Examination:* Examination by a trained Quartermaster Corps observer of the in-service garments available for study at the times of his visit yielded the data presented in Table IV. (All treated and untreated garments were grouped together, respectively, without regard to type.)

It must be emphasized that these garments did not include all of those still in test, for others were being worn or were in the supply channel at the time of the visit. Therefore the treated and untreated garments should be compared only within each laundry stage. Such sampling errors are inherent in semi-controlled experiments of this type, in which test data are a minor by-product of the normal

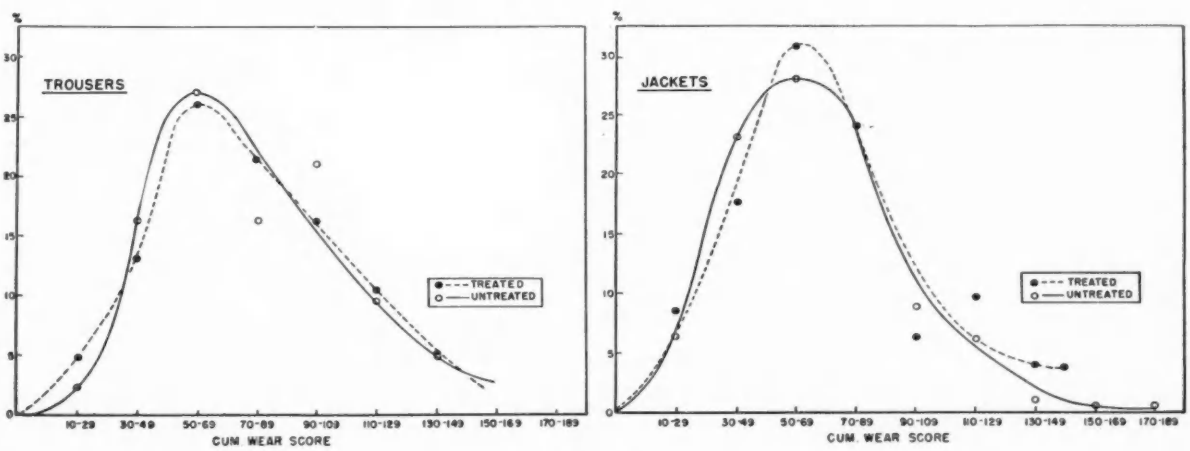

Figure 3

Comparison of the Cumulative Wear Scores of Treated & Untreated Garments Removed from Test

TABLE IV
Visual Comparison of Wear and Appearance of Untreated and Treated Garments

	Laundry Stage					
	35		45		55	
	U	T	U	T	U	T
No. of garments examined	107	74	121	53	26	51
Stained garments, %	21	19	0	2	4	3
Damaged garments, %	38	39	54	38	69	38

Notes: (1) The laundry stage indicates the maximum number of washings. The actual number of launderings received by specific garments ranged from a few to the number indicated.

(2) The stained garments were undamaged with regard to holes, tears, or severely abraded areas; but had lost their initial whiteness and bore stains not removable by normal washing.

(3) The damaged garments were still serviceable, but evidenced mended holes, tears, and severely abraded areas.

plant operation.

A chi-square analysis showed that no significant difference exists between the treated and untreated garments except for the percentages of damaged garments at the 55th laundry stage.

(2) *Laboratory Evaluation:* The characteristics selected for laboratory analysis (the test methods for which are detailed in the Appendix) were those most likely to yield useful information about the effect of the treatment on serviceability. Fabric texture, weight, breaking load (grab and cut-strip methods), ultimate elongation, tearing strength, thickness, spray rating, air permeability, abrasion resistance, extractable matter, size content, and cuprammonium fluidity; and yarn count, twist, breaking load, ultimate elongation, and abrasion resistance were evaluated.

In order to present the effect of the treatment upon each of the physical characteristics, Table V and VI list the average values for the untreated and treated drill and sheeting garments at each of five laundering wear cycles (5, 20, 35, 45, and 55) together with an analysis of the significance of the average differences for this range.

Those characteristics which were significantly affected by the treatment are abstracted from these tables and recapitulated below for ease of discussion:

Characteristic	Significance T—U
Fabric	
Spray rating	High for drill and sheeting
Extractable matter	Slight for drill and sheeting
Abrasion resistance	Slight for drill
Yarn	
Abrasion resistance	Slight for drill

The spray rating and percent extractable matter would be expected to be higher for the treated material because of the nature of the additive. Although the difference in abrasion resistance between the treated and untreated drill fabric is fairly consistent throughout the test, it is significant only at the 5th and 55th cycles.

d. *Conclusions:* This study indicates that under conditions of moderately severe wear and severe laundering operations, the use of aluminum salt—wax emulsion may be of some slight beneficence.

3. ORPHANAGE STUDY.—

a. *Objective:* To evaluate the effectiveness of a nondurable aluminum salt—wax emulsion treatment, applied during laundering, upon the wear resistance and appearance of play garments subjected to normal wear.

b. *Procedure:* This study was conducted under the auspices of the emulsion manufacturer and the administrative staff of a small orphanage. The Quartermaster Corps' participation involved supplying the fabric for the test garments and utilizing the facilities of its Philadelphia Research and Development Laboratories for pertinent textile analyses.

The test garments were overalls made by a commercial manufacturer from specification herringbone twill fabric (Cloth, Cotton, Herringbone Twill, Specification JAN-C-154). Eighty garments were issued in sets of two to each of forty children ranging in age from six to fourteen years. One garment of each pair was treated, the other served as the control. The wear-laundry cycle consisted of two days of wear followed by a washing. The children wore the garments during their normal activities, including play periods and more restrained social activities, such as going to ball games and attending motion pictures. Each set was worn by one subject only. The test was terminated after the garments had been subjected to fifteen cycles, as the orphanage authorities judged the overalls still in service to be no longer presentable as dress garments by that time. The laundry formula used in this study, which is that employed by an independent commercial laundry servicing the area in which the orphanage is located, is detailed in Table VII.

TABLE V
Comparison of Physical Properties of Drill Garments at Various Cycles

	No. of Cycles											Ave. Diff. T—U 5 thru 55 Launderings	Significance
	0	5		20		35		45		55			
		U	T	U	T	U	T	U	T	U	T		
FABRIC PROPERTY													
Texture, WxF	78x46	76x48	81x55	82x57	81x56	82x57	82x57	76x49	82x58	76x47	81x57	3x5	Nil
Weight, oz./sq. yd.	6.7	7.1	7.3	7.5	7.6	7.2	7.4	7.2	7.3	6.8	7.1	0.2	Nil
Breaking Load, lb., Grab—W	104	82	97	113	91	85	92	73	83	58	71	5	Nil
—F	66	61	60	75	62	64	62	46	55	37	52	2	Nil
Cut-Strip—W	75	51	67	79	67	63	74	45	60	41	56	9	Nil
—F	58	43	39	59	48	47	55	38	47	30	41	3	Nil
Ultimate Elongation, %, Grab—W	15	19	25	28	28	20	28	30	30	23	24	3	Nil
—F	20	18	20	24	21	17	20	20	21	15	20	2	Nil
Cut-Strip—W	14	21	23	23	23	24	25	24	27	24	24	1	Nil
—F	19	18	18	18	18	18	20	20	20	17	20	1	Nil
Tearing Strength, lb.—W	5.2	5.1	5.9	4.9	5.9	4.2	5.5	4.2	4.9	3.6	3.4	0.7	Nil
(Elmendorf)—F	3.9	4.7	3.6	4.0	4.5	3.5	3.6	4.8	4.7	2.5	3.5	0.1	Nil
Thickness, 0.001 in. (Pressure: 0.625 psi)	20.0	23.0	22.0	20.0	20.5	20.5	20.5	22.0	21.0	21.5	20.0	−0.6	Nil
Spray Rating (AATCC)	0	0	70	0	80	0	80	0	80	0	80	78	High
Air Permeability (Frazier)	24	21	15	15	18	19	18	32	18	33	25	−5	Nil
Extractable Matter, %	0.23	0.40	1.70	0.44	2.70	0.53	1.30	1.20	2.30	1.11	1.33	1.13	Slight
Size Content, %	1.60	1.20	1.20	1.22	1.10	1.50	1.40	1.70	1.50	2.38	1.86	−0.19	Nil
Cuprammonium Fluidity, Rhes	—	—	—	—	—	18.7	12.3	17.4	16.3	25.3	26.2	−1.9	Nil
Abrasion Resistance, Cycles to End-Point (Method #1)	600	550	1000	575	500	350	425	105	155	245	480	147	Slight
YARN PROPERTY													
Yarn Count, WxF	16x13	15x15	14x14	15x17	14x16	14x16	13x17	14x16	14x17	15x14	15x16	−0.6x0.4	Nil
Twist, tpi (Z), WxF	16x14	14x12	15x13	18x15	16x14	15x14	16x14	17x14	18x15	17x14	17x16	0.0x0.6	Nil
Breaking Load, g.—W	640	508	535	590	499	540	576	476	481	372	399	1	Nil
—F	721	603	454	513	517	540	522	544	458	358	372	−47	Nil
Ultimate Elongation, %—W	7	8	9	10	8	6	5	8	8	6	8	0	Nil
—F	7	7	5	7	7	5	4	7	6	5	5	−0.8	Nil
Abrasion Resistance,—W	93	83	201	68	51	44	92	30	44	4	10	34	Slight
Cycles to Break—F	—	—	—	25	31	20	21	24	19	2	7	2	Nil

TABLE VI
Comparison of Physical Properties of Sheeting Garments at Various Cycles

	No. of Cycles											Ave. Diff. T—U 5 thru 55 Launderings	Significance
	0	5		20		35		45		55			
		U	T	U	T	U	T	U	T	U	T		
FABRIC PROPERTY													
Texture, WxF	52x41	52x43	52x45	53x43	52x44	52x44	52x44	53x44	53x44	52x44	52x44	0x1	Nil
Weight, oz./sq. yd.	5.1	5.8	5.6	5.6	5.6	5.8	5.4	5.5	5.7	5.2	5.5	−.02	Nil
Breaking Load, lb., Grab—W	70	61	52	63	52	54	37	45	45	37	40	−7	Nil
—F	51	58	43	56	50	60	41	44	48	28	30	−7	Nil
Cut-Strip—W	60	47	42	28	43	47	31	42	40	32	35	1	Nil
—F	36	43	36	26	32	40	25	37	37	26	34	1.6	Nil
Ultimate Elongation, %, Grab,—W	12	16	19	21	24	22	17	21	21	18	19	0	Nil
—F	17	19	21	26	25	24	21	27	25	21	23	0	Nil
Cut-Strip—W	8	18	18	17	18	22	22	21	26	14	18	2.0	Nil
—F	20	19	20	19	13	24	20	28	25	17	24	−1.0	Nil
Tearing Strength, lb.—W	3.6	5.1	4.4	5.1	4.2	5.1	3.9	3.3	4.3	2.5	3.8	−0.1	Nil
(Elmendorf)—F	2.8	4.3	3.5	4.6	3.9	3.5	3.1	3.4	4.1	3.6	2.6	−0.4	Nil
Thickness, 0.001 in. (Pressure 0.625 psi)	16.0	20.5	19.5	18.0	18.0	20.0	19.0	20.0	19.0	18.5	18.0	−0.7	Nil
Spray Rating (AATCC)	0	0	70	0	80	0	80	0	80	0	80	78	High
Air Permeability	104	76	72	75	79	74	93	81	88	126	103	1	Nil
Extractable Matter, %	0.49	1.70	1.50	0.45	2.00	0.35	2.30	0.41	1.70	0.35	0.91	1.03	Slight
Size Content, %	2.00	1.60	1.40	0.88	1.00	1.80	1.90	1.90	1.60	2.00	1.71	−0.11	Nil
Cuprammonium Fluidity, Rhes.	—	—	—	—	—	14.0	20.5	17.3	17.5	27.0	24.2	1.3	Nil
Abrasion Resistance, Cycles to End-Point (Metnod #1)	125	225	175	100	150	75	100	35	35	65	70	6	Nil
YARN PROPERTY													
Yarn Count, WxF	15x15	13x13	14x13	14x15	14x13	14x13	13x12	14x13	15x14	14x14	15x16	0.4x0.0	Nil
Twist, tpi (Z), WxF	15x14	16x14	16x15	16x14	16x15	18x16	18x16	17x14	15x14	16x16	17x14	0.0x0.0	Nil
Breaking Load, g.—W	748	585	503	590	499	567	440	499	499	426	467	−52	Nil
—F	743	662	508	535	526	617	426	508	481	467	417	−85	Nil
Ultimate Elongation, %—W	7	7	8	9	7	5	5	6	7	6	7	0	Nil
—F	10	7	8	8	7	7	6	8	8	7	7	0	Nil
Abrasion Resistance,—W	72	152	116	78	46	93	45	65	50	18	33	−23	Nil
Cycles to Break,—F	—	—	—	56	37	103	15	38	30	14	23	−27	Nil

At the end of the study, fifteen sets of the original forty were submitted to these Laboratories for evaluation with the statement that the remaining twenty-five sets either had been lost or that the subjects had been unable to complete the test. Thus, these garments cannot be judged as to ultimate serviceability, but only as to appearance. On the assumption that the fifteen sets form a representative sample and that no bias existed in their selection, the garments were evaluated by a panel of judges ranging from textile experts to laymen. The garments were marked only as to set number, no indication being made as to which were treated and which untreated. The judges were asked to select the better garment of each pair for each of the following criteria:

1. Wear resistance—Which garment looks less worn?
2. Appearance—Which of the two garment fabrics looks more like the original? (A piece of original fabric was the standard of comparison.)
3. Body—Which of the two garment fabrics feels more like the original? (Same standard as in 2.)
4. Stain resistance—Which garment has the fewer stains?
5. General preference—Which of the two garments is preferable, taking all of the previous factors into consideration?

To isolate the effect of differences caused by the normal and modified laundry formulas alone, lengths of the herringbone twill fabric were given increasing numbers of launderings, the formula being the same as for the garments. One-yard samples of the treated and control fabric were removed after 2, 4, 6, 8, 10, 15, 25, 30, and 35 washing cycles, respectively, and subjected to the laboratory analysis. The test methods are detailed in the Appendix.

c. *Results:* Table VIII presents the data from the visual and tactile evaluation of the worn garments by the panel of judges.

Thus, from a subjective standpoint, the treated garments were definitely selected as being more wear resistant, as better maintaining their appearance and as being preferred on a general basis.

The results of the laboratory analysis are detailed in Table IX. The significant differences found by the laboratory between the treated and untreated fabrics are recapitulated below:

Characteristic	*Significance T—U*
Wear resistance	
Wyzenbeek	Slightly negative
Stoll	High
Extractable matter	High
Flexibility	Slightly negative

d. *Conclusion:* For garments subjected to moderate wear and moderate laundering, the use of the wax emulsion treatment appears to be justified. This conclusion should be interpreted in the light of the basic assumption that the garments evaluated are representative of the entire lot.

Discussion

The conditions and results of the three field tests are tabulated below:

Test	*Rel. Degree of Control*	*Relative Wear*	*Rel. Severity of Laundering*	*Effect of Treatment*
Ft. Jackson	High	Severe	Moderately Severe	None
Food Store	Fair	Moderate	Very Severe	Very Slight
Orphanage	Low	Moderate	Moderate	Significant

The primary difference between the Fort Jackson and the food store tests on one hand and the Orphanage study on the other is the severity of the laundering. The lengths of the laundry operations are: Fort Jackson—51 minutes; Food Store—69½ minutes (plus 10 minutes for treatment); and Orphanage—27 minutes (plus 10 minutes for treatment). The first two use alkali, the last does not. In addition, the food store formula includes a high temperature bleach. The difference in severity between the Orphanage and the Food Store fabrics is reflected in the values of cuprammonium fluidity which indicate the amount of chemical degradation of the cotton.

One effect of the difference is the continuous increase in extractable matter in the Orphanage fabrics as contrasted with the relatively constant amount in the Food Store fabrics over the course of the test. It is evident that for the Orphanage test the extractable matter accumulated on the untreated fabric differs from that on the treated, since no relationship exists between the extractable matter and abrasion resistance for the untreated material but a linear relationship is found in the latter case (Figure 4). It is presumed that the extractable matter in the untreated fabric consists of calcium soap deposits.

The difficulty of predicting actual serviceability on the basis of laboratory evaluation is well illustrated by this study.

TABLE VII

Laundry Formula—Orphanage Study

Operation	Water, In.	Time, Min.	Temp., °F.	Supplies
1. Suds	8	5	90-120	Soap (2 qt.)
2. Suds	5	5	120-140	Soap (1 qt.)
3. Suds	5	5	140	Soap (1 qt.)
4. Suds	5	5	140	Soap (1 qt.)
5. Rinse #1	8	3	140	Water
6. Rinse #2	8	3	140	Water
7. Rinse #3	8	3	140	Water
8. Rinse #4	8	3	140	Water
9. Sour	5	5	120	Sour (2 oz.)
*10. Treatment	2	10	100-120	Wax emulsion (1.5 qt.)
Total		47		

* Note: The concentration was 1 part emulsion to 20 parts water as recommended by the manufacturer. This operation was omitted for the control items.

In the Orphanage test, where the effect of the treatment was found to be significant, the abrasion resistance as determined on the Wyzenbeek Precision Wear Test Meter was ascertained to be slightly significant in favor of the untreated; but as determined on the Stoll-Quartermaster Universal Wear Tester (flat abrasion), the abrasion resistance was found to be highly significant in favor of the treated.

This apparent anomaly can be explained by the fact that the stiffness of fabrics adversely affects the abrasion resistance as determined on the Wyzenbeek apparatus, and the treated material is definitely less flexible than the untreated. In short, wax emulsion in the amount accumulated stiffens the fabric and reduces the Wyzenbeek abrasion resistance, but serves as a lubricant when the abrasion resistance is determined by a flat abrasion technique.

Resistance to flat abrasion, although being significantly better for the treated fabric and thus agreeing with visual observations, is not an adequate criterion for predicting serviceability. In the laundry phase of the Orphanage test, the resistance to flat abrasion increases with number of washings, indicating that the serviceability is increased by laundering, which is an untenable conclusion. In short, none of these laboratory tests can with justification be cited for the prediction of field serviceability.

Conclusions

On the basis of this study, it is concluded that:

(1) The use of a nondurable aluminum salt—wax emulsion for increasing wear resistance is not warranted for garments subjected to severe laundering or severe wear.

2. The use of a nondurable aluminum salt—wax emulsion may be justified for fabrics subjected to moderate laundering.

3. Field serviceability cannot be predicted by any of the standard laboratory tests.

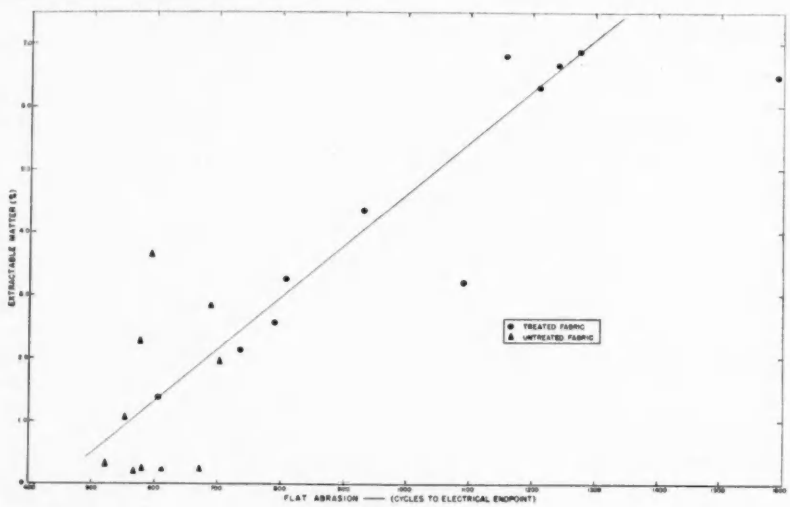

Figure 4

Relationship Between Abrasion Resistance & Extractable Matter (Orphanage Test)

TABLE VIII

Subjective Preferences by 15 Judges

Criterion	Definite Preferences for Treated Garments No.	%	Significance
1. Wear resistance	12	80	Positive
2. Appearance	14	93	Positive
3. Body	7	47	Nil
4. Stain resistance	8	53	Nil
5. General preference	13	87	Positive

APPENDIX

Methods of Procedure for Physical and Chemical Measurements

ABRASION RESISTANCE—FABRICS.—Method #1—Determined by the Wyzenbeek Precision Wear Test Meter, using 2 lb. load, 1 lb. tension and No. 0 Emery paper as the abradant. The endpoint was visual, i.e., first broken thread. The fabrics were abraded in the warp direction. The mean of 4 determinations is reported.

Method #2—Determined by the Wyzenbeek Precision Wear Test Meter, using 2 lb. load, 2 lb. tension and No. 0 Emery paper as the abradant. The fabrics were abraded warpwise for 250 cycles (double rubs) and the warp residual breaking strength determined. The mean of 8 determinations is reported.

Method #3—Determined by the Stoll-Quartermaster Universal Wear Tester *(1)*, using 4 lb. diaphragm pressure, 1 lb. load and No. 0 Emery paper as the abradant. The multidirectional flat abrasion technique was employed. The mean of 2 determinations is reported.

ABRASION RESISTANCE — YARNS.—Abrasion resistance of the yarns removed from the fabric was determined by the use of the Walker Yarn Abrader using the standard looping arrangement for thread-against-thread abrasion *(2)*. Tension on each yarn was 25 grams and the endpoint was a break. The mean of 72 yarn tests is reported.

YARN COUNT.—Determined by removing the yarn from the fabric, weighing it on an analytical balance and calculating the yarn count by the formula:

$$\text{Yarn Count} = \frac{\text{No. of yds. weighed} \times 0.54^*}{\text{Weight in grams}}$$

* This constant is derived as follows:

$$\frac{\text{453.6 (grams/lb.)}}{\text{840 (yds. in No. 1's cotton)}} = 0.54$$

The mean of 10 determinations is reported.

YARN TWIST.—Determined on 1-inch lengths by removing the twist on a twist counter.

YARN CRIMP.—Determined on a 3-inch woven sample, taken from the fabric, using 30 grams tension. The values obtained were divided by 3 and results reported

TABLE IX
Effect of Laundering on Untreated and Treated HBT Fabric

Property—	No. of Launderings: 0	2		4		6		8		10	
	U	U	T	U	T	U	T	U	T	U	T
FABRIC											
Texture, WXF	74x47	75x48	74x48	75x49	74x48	74x49	74x48	75x49	74x49	75x49	75x49
Weight, oz./sq. yd.	8.8	9.2	9.4	9.3	9.4	9.2	9.4	9.4	9.8	9.4	10.2
Breaking Load, lb.—W	117	104	104	106	105	107	110	108	111	111	111
Tearing Strength, lb.—W	5.35	6.55	8.65	5.80	4.90	6.05	8.35	6.38	5.28	8.24	8.52
(Elmendorf)—F	4.33	6.23	8.47	8.87	7.97	5.72	8.44	9.38	8.88	7.19	7.76
Thickness, 0.001 in (Pressure =0.625 lb./sq. in.	22	27	26	28	27	27	27	27	27	27	28
Flexibility, .0001 in.—lb.—W	2.9	2.5	4.3	3.0	4.2	3.1	4.3	2.9	4.1	3.5	3.7
—F	1.6	2.3	4.0	2.5	3.7	2.6	3.1	3.0	4.3	3.1	3.7
Air Permeability, Frazier (Cu. ft./min./sq. ft.) (P. D. =0.5 in.)	14	14	14	14	13	14	13	12	12	12	11
Extractable Matter, %	0.21	0.32	2.08	0.25	2.55	0.24	3.25	0.25	4.27	1.11	3.17
Cuprammonium Fluidity, Rhes.	10.1	11.2	12.1	15.6	12.4	11.5	11.1	13.0	10.5	11.6	9.9
*Abrasion Resistance Residual Breaking Load, lb.—W (Method #2)	67	55	19	58	19	59	11	58	20	25	33
**Cycles to Endpoint (Method #3)	553	517	734	580	795	671	805	611	923	551	1090
YARN											
Yarn Count, WXF	10x11	12x12	11x11	11x11	10x10	11x11	10x10	11x10	10x10	11x13	11x9
Breaking Load, g.—W	1000	885	870	960	885	970	923	943	893	906	855
—F	1055	970	830	1025	840	1025	962	1022	998	808	1083
Specific Strength, g/den.—W	1.90	1.93	1.72	1.95	1.73	2.01	1.80	1.96	1.74	1.85	1.70
—F	2.08	2.10	1.73	2.13	1.65	2.07	1.84	1.94	1.84	1.90	1.84
Crimp, %—W	13.0	13.7	16.7	17.7	15.7	16.0	18.0	14.7	16.0	16.3	16.3
—F	8.7	10.3	11.0	11.7	10.0	10.3	10.3	10.3	8.3	10.7	11.7

*Wyzenbeek Precision Wear Test Meter, 2 lb. load, 2 lb. tension—Abraded 250 cycles warpwise.
**Stoll Abrader—4 lb. diaphragm pressure, 1 lb. load, electrical endpoint.

No. of Launderings: 15		20		25		30		35		Average Difference T—U Over 2—35 Launderings	Significance
U	T	U	T	U	T	U	T	U	T		
75x50	75x50	75x51	75x50	75x50	75x48	75x50	75x49	75x50	75x50	−0.3x−0.6	Nil
9.3	10.0	9.3	9.9	9.4	9.7	9.3	9.7	9.5	9.7	0.4	Nil
96	97	99	102	105	99	109	106	96	92	−0.3	Nil
5.70	7.75	5.90	7.70	5.98	8.21	5.96	9.31	5.87	9.17	1.5	Nil
7.26	7.63	6.28	6.02	5.16	8.16	4.63	7.59	5.48	7.71	1.2	Nil
28	28	27	27	24	24	23	23	24	24	−0.1	Nil
2.9	4.7	3.1	4.3	2.5	4.3	3.2	3.8	2.7	3.8	1.2	Slight
3.0	4.3	2.8	4.5	2.6	3.7	2.9	3.4	2.9	3.5	1.1	Slight
12	11	13	12	12	12	14	13	12	11	−0.7	Nil
2.27	6.79	2.87	6.87	1.92	6.27	3.64	6.66	4.98	6.46	3.05	High
10.8	11.2	10.6	10.6	10.0	9.9	10.2	12.0	11.2	11.0	−0.5	Nil
53	36	57	43	66	34	61	28	61	34	−29	Slightly Neg.
574	1157	688	1276	701	1207	591	1242		1591	416	High
11x12	10x10	11x11	11x10	10x11	9x8	10x10	9x9	9x10	9x9	−0.7x−1.5	Nil
888	930	840	820	830	869	810	790	825	790	−23	Nil
950	900	860	940	870	888	869	749	903	796	−32	Nil
1.91	1.81	1.75	1.65	1.56	1.47	1.52	1.58	1.40	1.34	−.13	Nil
2.09	1.69	1.79	1.77	1.80	1.34	1.63	1.50	1.70	1.35	−.26	Nil
17.3	16.7	17.0	17.7	17.0	17.0	19.0	17.3	18.3	17.7	0.2	Nil
9.3	9.3	11.0	9.0	9.7	9.7	10.0	9.7	9.3	8.0	−0.6	Nil

for 1 inch. The mean of 10 determinations is reported.

YARN SPECIFIC STRENGTH.—Determined by the following formula:

$$\text{Specific strength} = \frac{\text{Breaking load, in grams}}{\text{Yarn Count, in deniers}}$$

The mean of 10 determinations is reported.

YARN BREAKING LOAD and ULTIMATE ELONGATION.—Determined on an inclined-plane type breaking strength apparatus. The mean of 10 determinations is reported.

EXTRACTABLE MATTER.—Determined on bone-dry specimens by use of a Soxhlet chloroform extractor. The value reported represents 1 determination.

SIZE CONTENT.—Determined by boiling the previously chloroform-extracted specimens in a ½% solution of hydrochloric acid for 45 minutes and then rinsing thoroughly. The value reported represents 1 determination.

CUPRAMMONIUM FLUIDITY.—Determined by measuring the viscosity of a dispersion of cellulose in cuprammonium hydroxide solution according to the method of Clibbens and Geake *(3)*. The value reported represents 1 determination.

The following tests were performed in accordance with Federal Specification for Textiles, General Specifications, Test Methods, CCC-T-191a, 23 April 1937, and Supplement thereto:

Atmospheric conditions—Standard conditions, Sec. II.
Weight—Method No. 2, Sec. X.
Cloth construction—Sec. XI, par. 1.
Breaking load
Grab method—Sec. VI.
Cut-strip method—Sec. VII, par. 2.
Thickness—Sec. XII, par. 3.
Tearing strength—Elmendorf method, Sec. III, par. 1, Supplement, using half size specimens and augmenting weight.
Air permeability—Sec. III, par. 3c, Supplement, 0.5″ water pressure differential.
Spray rating—Sec. III, par. 5a(1), Supplement.

For each of the above tests, spray rating excepted, the values reported repre-

sent the mean of 5 determinations. Only 1 determination was made for spray rating.

Acknowledgment

The authors wish to express their appreciation to the personnel of the Quartermaster Board, to H. J. Berger, manager of the food chain laundry, and to Miss Roskilly, administrator of the orphanage, for their cooperation in performing the field tests; and to Gerald Winston, Statistician, and Elliott A. Snell, Technologist, of the Quartermatser Corps' Textile Research Laboratories, for their aid in the statistical and laboratory analysis phases, respectively, of the study.

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ABSTRACTS

X-Ray Irradiation of Cellulose Acetate

N. N. Winogradoff, Nature *165*, 72, Jan. 14, 1950.

As is well known, the physical properties of many plastics are modified when they are exposed to light or ultra-violet radiation. In the course of work on these phenomena, samples of undyed cellulose acetate yarn were suspended in front of an 0.001 in. aluminum window of a copper-target X-ray tube, operated at 50 kVp., 30 m. amps., and were exposed to the radiation for periods up to 190 hours.

After 120 hours the tensile strength had decreased over 50 per cent (acetate containing 3 per cent titanium dioxide gave a similar result). X-ray diffraction photographs, taken after irradiation, showed a progressive diffuseness of the pattern.

After a 40-hour exposure the irradiated sample showed a marked yellowish-brown coloration; and after an exposure of only 20 hours it was rapidly delustered in a 1.4 per cent phenol solution, which is too weak to deluster unexposed acetate. This effect suggests that X-ray irradiation decreases the crystallinity of the sample, thus confirming the results of the diffraction photographs.

The experiments described seem to indicate that chemical and structural changes may take place in certain substances during the long exposures required for X-ray diffraction patterns, and may influence the interpretation of the diagrams.

Note: in a later issue of Nature *(165*, 123 (1950)) the same author discusses "X-ray Irradiation of Polystyrene, Polythene and Paraffin Wax."—W.H.C.

Boiler Feedwater Treatment

P. Hamer, Textile Mfr. *76*, 110-12, March, 1950.

The aim of water treatment is to prevent scale formation, to control the amount of sludge in the boiler, and to reduce or eliminate corrosion and the contamination of steam by salts present in the boiler water.

Chemical analysis has shown that the chief constituents of hard scales are calcium sulfate and calcium and magnesium silicates, and that the soft sludges are composed of calcium carbonate and magnesium hydroxide.

The principles of conditioning against scale formation were worked out by Dr. R. E. Hall, who found that by the addition of the right amount of sodium carbonate to a boiler water containing calcium sulfate the calcium could be preferentially precipitated as calcium carbonate, which is only slightly soluble in water and forms a loose soft sludge instead of adherent scale. Sodium carbonate decomposes in the boiler, to a degree depending on the working pressure and steaming rate, forming caustic soda which will precipitate residual hardness due to magnesium salts as a sludge of magnesium hydroxide. At working pressures above 200 lbs. per sq. in. the decomposition of sodium carbonate is usually too great to maintain the required concentration of carbonate in the boiler water, and sodium phosphate (Na_3PO_4) is used instead, since the phosphate ion (PO_4) is stable at all boiler temperatures, and calcium phosphate is less soluble than calcium carbonate so that it also forms as a sludge.

There is little doubt that at boiler temperatures steel and water react together with the formation of magnetite (Fe_3O_4) and the evolution of hydrogen, but the reaction is quickly brought to a stop because the magnetite forms an adherent layer on the metal surface. Dissolved oxygen would tend to break down this layer and promote fresh corrosion, but caustic soda and sodium phosphate should assist repair at points of breakdown.

Dissolved oxygen can also cause corrosion in economizers and preheaters so that the removal of oxygen from the feedwater by vacuum or high temperature deaeration is the most important countermeasure to corrosion in all parts of the boiler.

The author also cautions against the presence of salts in the steam, due to entrainment of particles of boiler water, and makes various suggestions for avoiding this danger.—W.H.C.

Influence of the Cuticle in the Dyeing of the Wool Fiber

H. E. Millson and L. H. Turl, Canadian Textile J. *67*, 51-4, Mar. 17, 1950.

In the dyeing of wool the penetration of the dye into the fiber is essential to the full development of shade and fastness. This behavior is governed both by the nature of the dye and by the nature of the fiber itself.

Skittery, unlevel and tippy dyeings exemplify lack of uniform penetration and distribution of dyestuff in the fiber, since solidity of shade is directly dependent upon these factors.

It has been shown that the wool fiber consists of a complex surface component called the cuticle, and a complex inner structure called the cortex.

In the present investigation, an attempt has been made to study the dependence of dye penetration upon physical factors such as fiber distortions, natural degradations, incision or mechanical damage to the cuticle. The penetration of dyes into cut ends and crushed areas of fibers has been observed previously. The earlier work has now been extended to include many dyes applied by a variety of methods. The progress of penetration through such physical defects has also been observed in detail. It was further believed that physical distortion, such as in knotted fibers, would produce changed rates of penetration of dyes. This belief has been substantiated.

In addition to natural and artificial physical disorganization of the surface struc-

(Concluded on Page 384)

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Northern New England Section—

MEASUREMENT OF DYE STRENGTHS*

E. I. STEARNS

A Contribution of the Application Research Department, Calco Chemical Division, American Cyanamid Co.

In the absence of shade variations dye strengths can be estimated visually to the nearest 5% by straight dyeings or, in some cases, to the nearest 1% by combination dyeings. Strengths can be calculated from spectrophotometric reflection data by using the Pineo formula. In the presence of shade variations any strength estimate is approximate. In any case, exact dyeing conditions must be specified.

MONEY value in various competing dyes is of fundamental interest to the whole dyestuff consuming industry. Money value is the ratio of coloring power of a dye to its cost per pound. The coloring power of a dye is usually referred to as its strength. Thus, one dye is said to be equal in strength to another if it is possible to replace the first with the second in a dyeing formula and to get the equivalent color with an equivalent amount of dye.

SIMPLE CASE.—The simplest case of estimation of dye strength is that in which there is no shade difference between the sample and the standard. There are two common ways in which such comparisons are carried out by industry. In the first method, if the sample is believed to be about 100% strong as comparative pour-outs of the dye solution on filter paper may indicate, the standard is prepared at three concentrations: namely, 110%, 100% and 90% of the usual percent dyeing. The sample is prepared at 100%. The dyeing of the sample is then compared with the series of dyeings of the standard and the nearest standard dyeing chosen.

A second method is to make a series of two dyeings of the standard: one at the standard concentration, say 1%, and the other at 0.9% dyeing. In addition a set of two dyeings of the sample are made, also at 1% and 0.9%. These four dyeings are then judged visually. First, the two standards are examined, and the *spread* between them checked with the *spread* of the samples. This examination gives a check on the preparation of the skeins. The spreads also serve to *calibrate* the observer, reminding him what a 10% reduction looks like. Then the 1% dyeing of the sample is compared with the 1% of the standard. If they appear alike, the dye strength is 100%. A comparison of the 0.9% dyeings should show them to be alike also, thus checking the 100% dye-strength reading. If the dye sample appears weaker, the 1.0% dyeing of the sample is compared against the 0.9% of the standard and, if they are alike, the dye-strength is 90%. On the other hand, if the dye sample appears strong, the 0.9% dyeing of the sample is compared against the 1.0% of the standard, and, if alike, the dye strength is 110%.

In some cases the 1% dyeing of the sample will fall between the 1% and 0.9% dyeings of the standard and the sample will be rated 95%. A check of this value can be obtained by seeing if the 0.9% standard falls between the 1% and 0.9% of the sample skeins. Similarly, strengths of 105% can be read and checked. Of course, in some cases the strength will fall outside of the limits of 90% and 110%, and for either method of test the dyeings must be repeated with suitable adjustments of concentration.

Table I compares the two methods of test.

Both methods require the same number of dyeings and the same amount of work in sample preparation. The methods have the same strength range over which a comparison can be made. Both methods give the observer two spreads of 10% strength variation with which to calibrate his eye. In these three respects both methods are equal in efficiency. But the second method provides a rough check for gross errors for all four skeins, whereas in the first method the single dyeing of the sample is not checked. Also, the second method provides a second strength comparison if the dye strength happens to fall in the range of 95-105% as is often the case; thus, the second method is to be preferred.

The ability to determine strength differences varies with the difficulty of preparing exact dyeings and with the difficulty of visual estimation. In general, strengths can be estimated from a single set of dyeings to the nearest 5%.

The fundamental concept of strength is an equivalence. It is assumed that by a proper choice of percentage dyeing of the sample it is possible to match exactly, in all color aspects, the appearance of the standard. When such an exact match is obtained, the strength of the sample is merely the ratio of the percentage dyeing of the standard to the percentage dyeing of the sample.

It is a well-known fact that strength differences are more exactly determinable with the average blue dye than with the average yellow dye. A qualitative explanation of this is readily apparent from a consideration of the spectrophotometric curves. Fig. 1 shows the reflectance curves of Quinoline Yellow (C.I. 801) at 0.5 and 0.6%. It is drawn on a rather special plot. The abscissa has its wavelength in-

TABLE I
COMPARISON OF STRENGTH TEST METHODS

	I Method of 3 Standards *1 Sample*	*II* Method of 2 Standards *2 Samples*
Total number of dyeings	4	4
Range of possible comparison	90-110	90-110
Spreads for calibration	2	2
Range of double check	0	95-105
Dyeings that can be checked for gross errors	3	4

* Presented before Northern New England Section at Lowell, Mass., Nov. 1949.

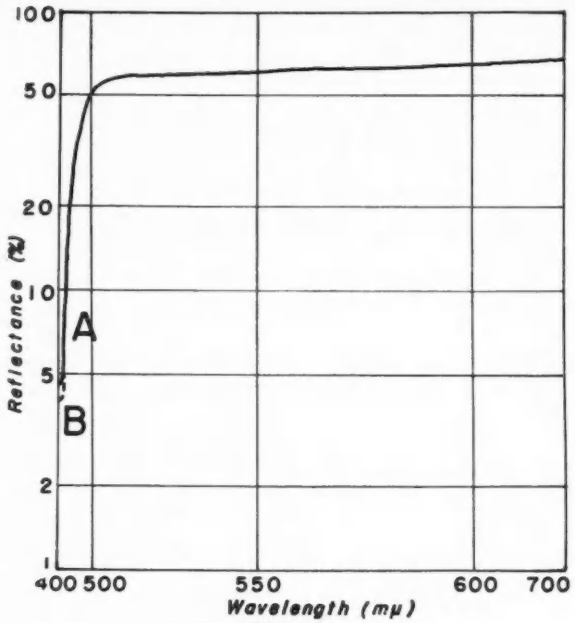


Figure 1
Strength Variation in a Yellow
A. 0.5% Quinoline Yellow (C.I. 801) on wool.
B. 0.6% Quinoline Yellow (C.I. 801) on wool.
The reflectance ordinate is spaced logarithmically in accordance with Fechner's Law.
The wavelength abscissa is spaced in accordance with the photopic visibility function.

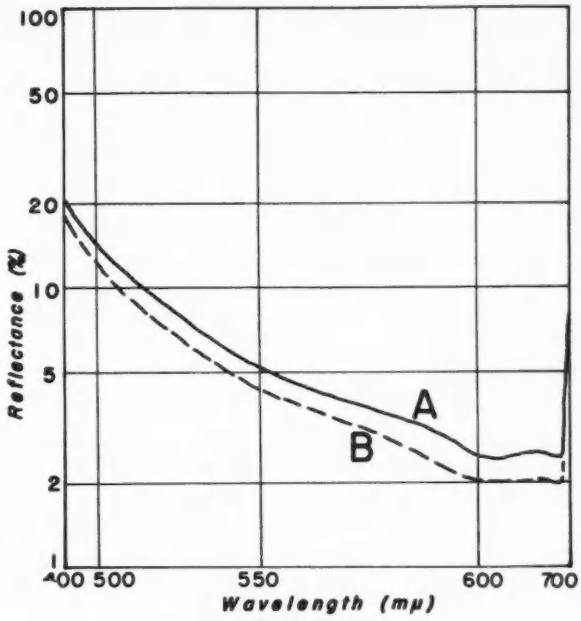


Figure 2
Strength Variation in a Blue
A. 1.0% Alizarin Saphirol B (C.I. 1054) on wool.
B. 1.2% Alizarin Saphirol B (C.I. 1054) on wool.
The ordinate and abscissa functions are the same as Fig. 1.

tervals chosen so that the area over each interval is equally visible in daylight. Those who are familiar with the techniques of colorimetry will recognize it as having the selected ordinates of the visibility function equally spaced. The 20% difference in strength of this yellow dye introduces a change of 0.1% in the amount of light reflected. It is no wonder that the eye has a hard time seeing it.

Fig. 2 shows the reflectance curve of Alizarin Saphirol B (C.I. 1054) at 1.0 and 1.2%. It is plotted on the same scale as Fig. 1. It is noteworthy that the blue absorbs a considerable amount of light. Consequently, when a change of strength is introduced, the change in the amount of light reflected is 16.0%, a relatively large amount; thus, the strength difference is more easily seen.

METHODS OF INCREASING VISUAL SENSITIVITY.—Since a strength change is more esaily detected if a greater percentage of the reflected light is affected by dye, a method of increasing the sensitivity of visual examination is to use a light that is complimentary to the color of the dye. Thus, the yellow dyeings will be more sensitively read by the bluish light of a north sky, and the blue better read by the direct rays of the sun, which are yellowish.

It is also a well-established fact that a shade difference, that is, a difference in hue, is more easily seen than a difference in light intensity. Fig. 3A shows a hypothetical spectrophotometric curve, the horizontal line at 50% reflectance, and a second curve B which differs from it by 1% at all wavelengths. This second curve is a horizontal line at 49%. The visual difference in these two curves can be calculated by methods which have been described in the literature *(6)*. Using one of these methods, the Adams chromatic value method, the difference is found to be 0.03 units. Fig. 3C shows a third curve which differs from Curve 3A by 1% at all wavelengths again; but the curve of 3C reflects 1% less at all wavelengths up to 556.3 mμ and 1% more at all wavelengths longer than 556.3 mμ. It is found by calculation that the same amount of visual light is reflected by both curves 3A and 3C, but there is a shade difference. When the magnitude of the visual shade difference is calculated by the same formula, used above, the visual difference is found to be 0.08 units; thus, the same magnitude of curve difference is more easily seen if it produces a shade difference than if it produces an intensity difference.

The practical dyer has long been aware of a method that takes advantage of both of these methods of accentuating strength differences. In the case of a yellow, the dyeing is made with the addition of a constant amount of blue dye to all four dyeings in the set used for evaluation. Fig. 4 shows the spectrophotometric curves of two dyeings with 0.5% concentration of Alizarin Saphirol B (C.I. 1054) in both but the Quinoline Yellow (C.I. 801) differing by 20%. It will be noted that in this case the change in the yellow concentration affects a much greater percentage of the reflected light. The percentage decrease is 0.7% whereas previously when the yellow was dyed alone it was only 0.1%. It is also observed that the dyeing with the higher percentage of yellow is a yellower green shade than the weaker one. This shade difference, added to the proportionately larger intensity change, makes a smaller strength difference in the yellow dye more easily seen.

In order to see a smaller strength difference in a red dye, it is common practice to add both a yellow and a blue dye in constant amount in order to produce a taupe shade. Thus, in order to see a small strength difference in Amido Naphthol Red G (C.I. 31), it can be dyed at 0.1% with 0.16% of Xylene Light Yellow (C.I. 639) and 0.06% of Alizarin Saphirol B (C.I. 1054). The curves of a standard dyeing, and one differing by 20% in the red component, are shown in Fig. 5. By

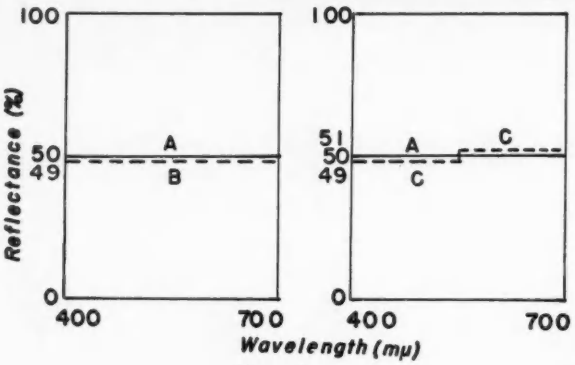


Figure 3
Comparative Discernibility of Strength and Shade Variations.
A. Hypothetical spectrophotometric curve showing 50% reflectance at all wavelengths.
B. Hypothetical spectrophotometric curve showing 49% reflectance at all wavelengths.
C. Hypothetical spectrophotometric curve showing 49% reflectance from 400 to 556.3 mu and 51% from 556.3 to 700 mu.

this method dyeings differing by 1% in strength can be placed in order without difficulty. This is about the ultimate in small strength differences that are visually discernible. Unfortunately, this method of combination dyeing fails when there is a shade difference, and hence is not generally useful in practice.

EFFECT OF SHADE DIFFERENCE.—The idea of money value is of such great use to the business and accounting end of the dyeing industry that every effort is made to extend the concept to a wide range of comparisons. No one attempts to compare a blue dye with a yellow dye and give a comparative strength, but comparisons of a red-shade yellow with a green-shade yellow are commonly expected of the dye-evaluation laboratory. This is a violation of the fundamental concept of strength. The equivalence concept demands that by adjusting the concentration of dye on the textile a skein can be made from the dye sample which is equivalent in all color aspects to the standard skein; but it is found that when a series of skeins at different concentrations of dye are prepared for the red-shade yellow, there is never an exact correspondence between any of the skeins and the standard skein. The problem then is for the dye-tester to choose the skein that comes closest to standard. It is here that opinions start to differ. Colorists have little difficulty agreeing within 5% strength when there is no shade difference, but as the shade difference increases the opinions vary more and more *(13)* until finally a strength comparison becomes worthless. There is a continual conflict between the accountant and the dye-tester, the accountant trying to include more and more comparisons because a single number is so convenient for him to work with, the dye-tester trying to exclude the far off-shade comparisons because he knows they are only estimates and should not be carried out to as many decimal places as the accountant wishes.

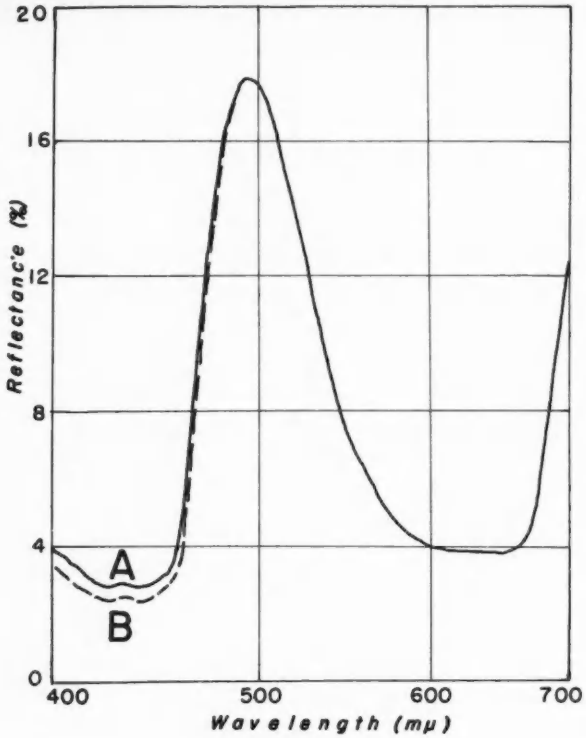


Figure 4
Increased Visual Strength Sensitivity for a Yellow
A. 0.5% Quinoline Yellow (C.I. 801).
0.5% Alizarin Saphirol B (C.I. 1054).
B. 0.6% Quinoline Yellow (C.I. 801).
0.5% Alizarin Saphirol B (C.I. 1054).
Dyeings made on wool skeins.

The physicist has examined this question of strength comparison of off-shade samples because it is possible that a scientific and rigid rule could be applied which would permit some kind of an impersonal, instrumental method of strength determination. It is first necessary to understand how a physicist describes the various color differences that a strength series exhibits in order to be able to talk with him.

Color is three dimensional. The textile colorist recognizes this in his terminology. A sample of a red dye is compared with a standard and might be stronger, bluer and brighter, three adjectives being used to describe the three dimensions of difference. There are several three-dimensional methods of representation which the physicist uses, and the data from one can be converted to another by suitable calculations. To illustrate the present point, the Munsell color solid has been chosen. In this system the one dimension is value and corresponds to the amount of visual light reflected. A number 0 can be assigned to the perfect black, a sample which reflects no light, and a value of 10 to the perfect reflector, a sample which reflects all the light that strikes it. This is represented by vertical height in the three dimensional representation. The second dimension in this system is called hue. All the hues are arranged around a circle in the regular order: red, orange, yellow, green, blue and violet, with violet adjacent to red on the circle. The hues are called by somewhat different names than these conventional textile names, but this is of small consequence because, with a Munsell Book of Color, one can look at a physical sample and see for oneself what the color really is. The third variable is called chroma. All samples that are gray, regardless of whether the gray is so light that it is a white or so dark that it is a black, have a chroma of 0. As a sample differs from gray, regardless of its hue, it is assigned larger numbers to describe its chroma. Fig. 6 shows the three dimensional grid in which all colors may be plotted in accordance with the three parameters: value, hue and chroma. This system has been fully described in the literature *(1)*.

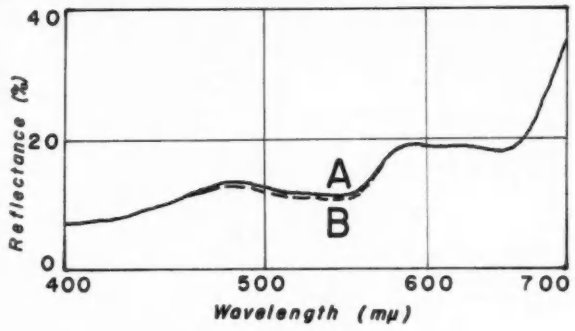


Figure 5
Increased Visual Strength Sensitivity for a Red
A. 0.1% Amido Naphthol Red G (C.I. 31).
0.16% Xylene Light Yellow (C.I. 639).
0.06% Alizarin Saphirol B (C.I. 1054).
B. 0.12% Amido Naphthol Red G (C.I. 31).
0.16% Xylene Light Yellow (C.I. 639).
0.06% Alizarin Saphirol B (C.I. 1054).
Dyeings made on wool skeins.

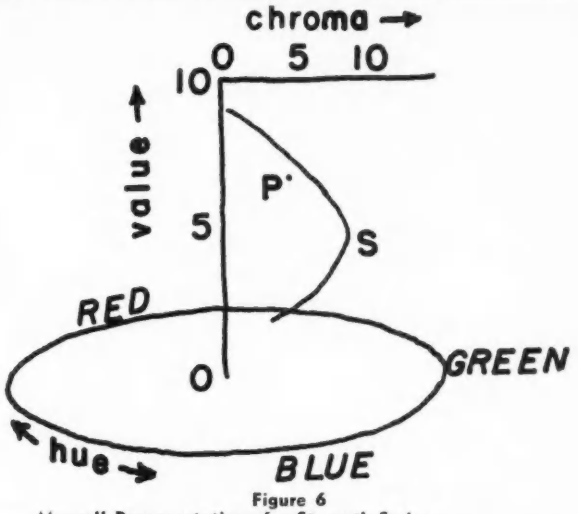


Figure 6
Munsell Representation of a Strength Series
S = locus of strength variations from 0 to 100% of Caledon Jade Green (C.I. 1101).
P = Point representing hypothetical off-shade green submitted for strength comparison.

Also shown in Fig. 6 is a curved line, which is the locus of points representing the strength variation of a green. A series of dyeings was made up at various strengths, they were measured on a spectrophotometer, the colorimetric values were calculated by standard methods *(3)*, and the points were plotted. The uppermost point is that of undyed cotton, the next a 2% dyeing, and finally the last one a 100% dyeing. Table II shows how the hue, value and chroma vary as the strength is increased.

It will be noted that, as the strength increases, all three colorimetric properties change. It is not possible to get a simple correlation between strength and any one of these parameters.

Also shown on Fig 6 is a point (P) which represents a sample which is to be evaluated for strength against the standard series. It will be remembered that in the case of an off-shade sample, the customary practice is to report the visually "closest" sample and calculate strength on that basis. It would seem that if "closest" could be defined, a strength comparison could be made on an objective basis.

The question of how the dyer determines which is closest has been reported in detail by Waters *(12)*. In one example, Waters introduced a dullness into a red dye by purposely adding a small amount of black dye. A bright red—Lissamine Fast Red BG—was dyed at a series of concentrations. Next, he dyed a sample replacing four parts of red with four parts of the black. This gave him 96 parts of red and 4 parts of black. The series of straight red dye showed that as the concentration increased, the value decreased and the chroma increased. There was practically no change in hue. The sample dyed with a black present, of course, did not fall on this strength-series line. Fig. 7 shows schematically the change in colorimetric properties with change in strength by the line S. It also shows the dull sample plotted at C. The question to be answered was, how strong is the dull sample C against the strength series S? What would the dyer call the closest match? Before the experiment was carried out, it was thought possible that value was the important thing. The strength series reaches the same value as the dull sample at a concentration of 120%. A second thought was that the chroma was the important thing. The strength series reached the same chroma as the dull sample at 82% concentration. The third possibility was that the dyer might ignore the amount of black present and report the actual amount of red dye present by some sort of a mental adjustment. It is known from the formulation that the real red dye concentration is 96%. Of course, if the black is considered to be made up of equal parts of red, yellow and blue, then the total red present would be 97.3%, but this is not significantly different from 96%. Thus, there are three possibilities which might be predicted beforehand: 82, 96 or 120%. These are indicated in Fig. 7. When 26 color matchers were asked the question, "What is the strength?", there was some disagreement; the highest strength estimate was 15% greater than the lowest. The average answer was 92%, which made the sample 4% weaker than its real red dye content. It may be of interest to note in passing that untrained observers called this sample 101% on the average. If the true strength is considered to be 97.3, then the untrained men were closer than the trained men to the actual dye content. The expression is frequently heard among dye-testers who are training new men in the art of color matching, "Don't mistake dullness for strength." The untrained men did mistake dullness for strength, but the trained men were so anxious to avoid this that they overcorrected and ended up further off in the opposite direction.

When an attempt was made to carry out a similar experiment in which a difference in hue was introduced, the colorists refused to cooperate. Even with a fairly

TABLE II
COLORIMETRIC VALUES OF A STRENGTH SERIES
CALEDON JADE GREEN (C.I. 101) ON COTTON

Strength % o.w.f.	*Value*	*Hue*	*Chroma*
0	9.0	10B	1.1
2	5.7	4BG	7.6
4	4.8	5BG	8.4
8	4.0	4BG	7.8
16	3.3	3BG	7.0
32	2.6	3BG	6.5
64	2.3	3BG	5.0
100	2.1	4BG	4.0

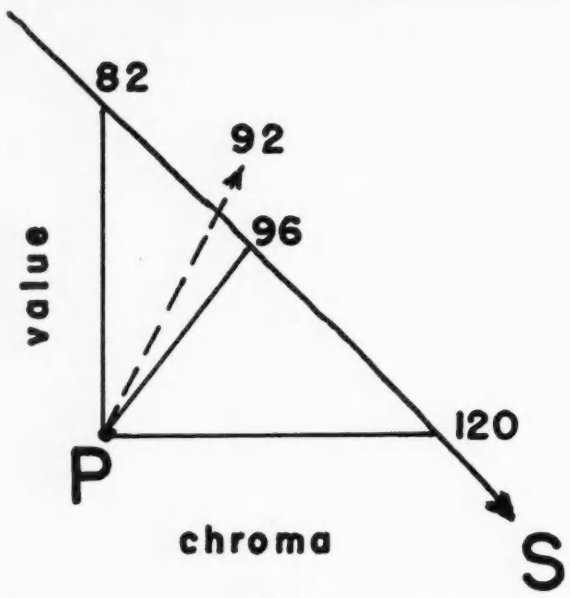


Figure 7
Strength Evaluation of Off-Shade Sample, Munsell Representation.
S = locus of strength series.
P = point representing off-shade red.
82 = relative strength for equal chroma.
96 = relative strength for equal red dye content.
120 = relative strength for equal value.
92 = relative strength by average 26 experienced colorists.

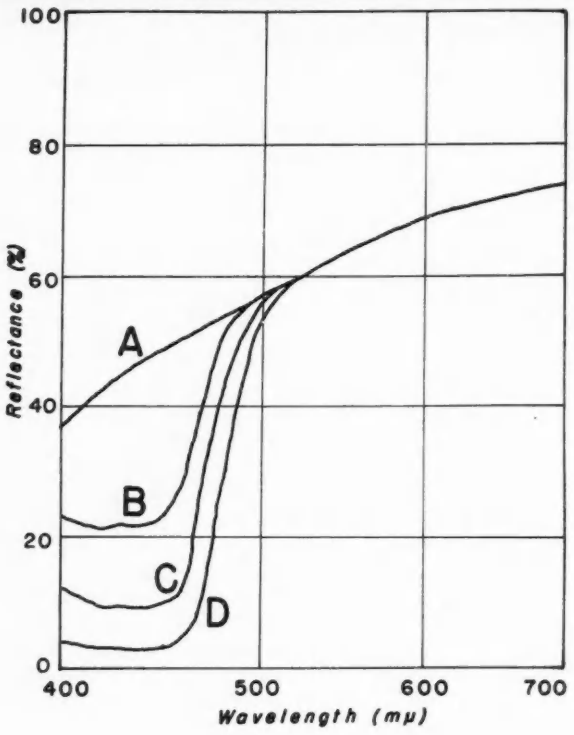


Figure 8
Colorimetric Strength Build-Up of "Green Shade" Yellow
A = undyed wool flannel.
B = 1/32% dyeing of Quinoline Yellow (C.I. 801).
C = 1/8% dyeing of Quinoline Yellow (C.I. 801).
D = 1/2% dyeing of Quinoline Yellow (C.I. 801).

small hue difference they said that no strength comparison was possible.

It was stated above that the strength of off-shade dyeings could be estimated colorimetrically and objectively if the word "closest" could be defined. The above example from Waters shows that this is not easy. The trained color matchers refuse to judge if there is much of a hue difference; they show quite a spread of estimates among themselves if the difference is dullness, and they tend to overcompensate for dullness. It seems best to add "approximately" to any strength estimation of off-shade material regardless of how well the accountants like it.

OTHER DIFFICULTIES.—If it is assumed that somehow a strength estimation can be given even though the shade is off, further difficulties arise. There are many factors that affect strength, as for instance, the nature of the fiber on which the dye is put. A comparison of Diamine Scarlet B (C.I. 382) on cotton to Calcomine Fast Red 8B shows a strength comparison of approximately 100%. When dyed on wool, on the other hand, Calcomine Fast 8B is only 1% in strength because it does no more than stain the wool, whereas the Diamine Scarlet B gives a good dyeing. When Metachrome Brown C (C.I. 101) is compared with Anthracene Chromate Brown EB (Pr. 14) on wool by the top-chrome method, it is 70% strong. When it is compared by the meta-chrome method, it is 130% strong. What then is the strength of the B vs. the EB? What is the strength of the red vs. the scarlet? It all depends on the fiber and dyeing method. There is no such thing as a single strength value which applies to all cases.

Another factor affecting strength estimation is concentration. It is frequently said that dyes differ in build-up. It is not generally realized that a difference in build-up can result from two entirely different factors: one the affinity of the dye for the fiber, the other the colorimetric properties of the dye. Table III shows the values of % exhaustion vs. % dyeing for two dyes: Diamine Black BH (C.I. 401) and Calcomine Blue DR, both dyed direct, which are similar in colorimetric properties, that is, in the shape of their spectrophotometric curves.

The BH exhausts fairly well at low concentrations but poorly at high concentrations, while the DR is relatively constant. This means that, if a strength comparison is made of the BH vs. the DR at 0.2%, the BH will appear 100%, while at 4% the BH appears weaker by at least 25%. How strong is BH against DR? It all depends on the test concentration.

Fig. 8 shows the spectrophotometric curves of a concentration series of dyeings of Quinoline Yellow (C.I. 801) on wool. The curve is very steep. Regardless of how strongly it is dyed, there is never any absorption introduced at 550 mμ, and the result is that the samples do not change hue toward the red as the concentration is increased. If 5% of Orange II (C.I. 151) is added, giving a blend of 95% Yellow and 5% Orange, the orange is scarcely noticeable at a 1/32% dyeing.

TABLE III
EXHAUST VALUES OF TWO BLUE DYES

Name of Dye	*% Dyeing*	*% Dye in the Exhaust*
Diamine Black BH (C.I. 401) (Direct)	0.2	11
Diamine Black BH (C.I. 401) (Direct)	4.0	33
Calcomine Blue DR	0.2	48
Calcomine Blue DR	4.0	48

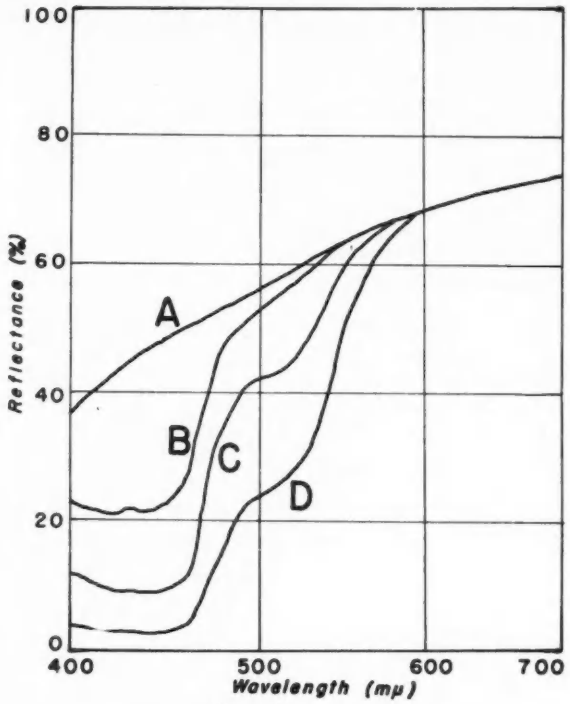


Figure 9
Colorimetric Strength Build-Up of "Red-Shade" Yellow
A = undyed wool flannel.
B = 1/32% dyeing of mix.
C = 1/8% dyeing of mix.
D = 1/2% dyeing of mix.
Mix = 95 parts Quinoline Yellow (C.I. 801).
5 parts of Orange II (C.I. 151).

As the concentration is increased, the absorption of the orange becomes significant, as it may be seen in Fig. 9, and the heavier dyeings change in hue toward red. If the question is asked, "How strong is the yellow against the blend of yellow and orange?", the answer is "It all depends on the concentration at which the comparison is made."

The color change toward red was artificially introduced in the illustrative case above, but many dyes behave this way by their own accord. Naphthol Yellow S (C.I. 10) and Xylene Light Yellow (C.I. 639) are typical of dyes that have steep curves with practically no absorption at wavelengths much longer than the absorption maximum and, hence, do not change hue radically as the concentration is increased. Anthracene Yellow C (C.I. 343) and Alizarin Yellow 2G (C.I. 36) are typical of yellows that have a sloping curve, that do have appreciable absorption at longer wavelengths and that do build up red or brown at higher concentrations. This behavior is entirely independent of the amount of dye exhausted from the dyebath. Fig. 10 shows the curves of the two steeply rising yellows and the two sloping yellows.

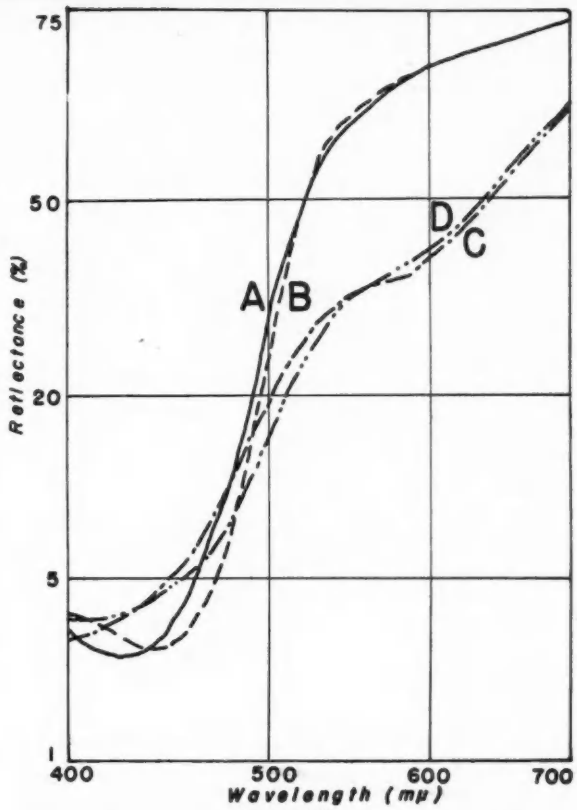


Figure 10
Yellow Dyes with Different Colorimetric "Build-Up"
Dyes C and D build-up red compared to A and B.
A 1% Xylene Light Yellow (C. I. 639).
B 1/2% Naphthol Yellow S (C.I. 10).
C 1/4% Anthracene Yellow C (C.I. 343) top chromed.
D 1/4% Alizarin Yellow 2G, (C.I. 36) top chromed.
The ordinate is implicit in log ((1-R)² /2R) where
R = reflectance.

SPECTROPHOTOMETRIC EVALUATION OF STRENGTH.—Some work has been done to read strength directly from spectrophotometric reflection curves without calculating colorimetric values. This work has thus far been limited to measuring changes in concentration, which are not associated with changes in shade. The problem is to find the relation between measured reflectance and concentration. The advantages of this method are that comparisons may be made without having a series of skeins at different strengths dyed and there will be less eye fatigue.

The most successful method of doing this has been pointed out by O. W. Pineo *(9)*. Pineo stated that the reflectance was related to the concentration by the formula:

$$\frac{(1 - (R - s)^{1/n})^2}{2(R - s)^{1/n}} = kc + a$$

Where R = unit reflectance.
s = a constant, which may be thought of as surface reflectance.
n = a constant, which may be thought of as an optical property within the fiber.
k = the absorbency of the dye, which is a function of wavelength.
c = concentration of dye.
a = absorbency of the undyed fiber, also a function of wavelength.

If s = 0, n = 1, and a = 0, this equation reduces to the equation independently derivable from the relationship of Kubelka and Munk *(4)*. Pineo differs from Kubelka and Munk in that his independently derived equation includes additional constants s, n and a, which are needed to fit the observed data, and he conceived the idea of making a cam and optical system *(8, 9)* for a spectrophotometer which would cause it to plot his function directly.

Many other formulas, which do not agree with our experimental data so well, have been proposed to relate reflectance to concentration, including those of Nutting *(7)*, Preston and Tsein *(10)* and Selling *(11)*. The formula of Selling is compared with the formula of Pineo in Fig. 11, and it is evident that they are

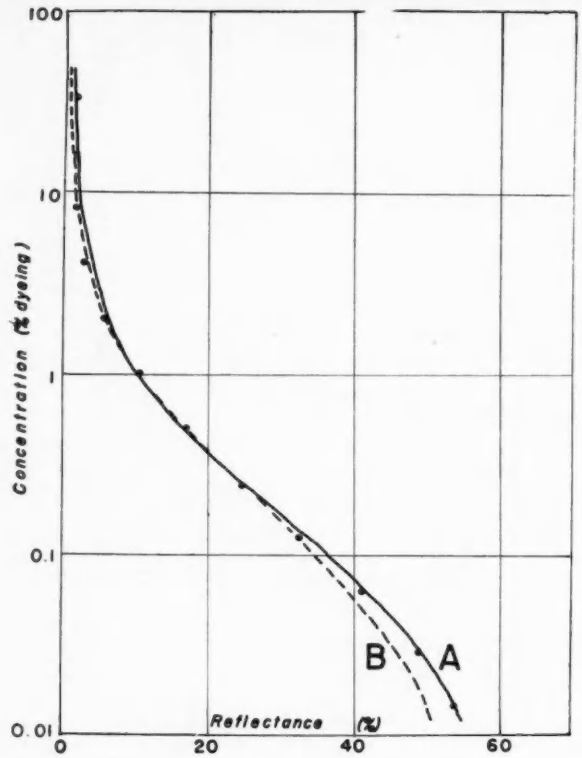
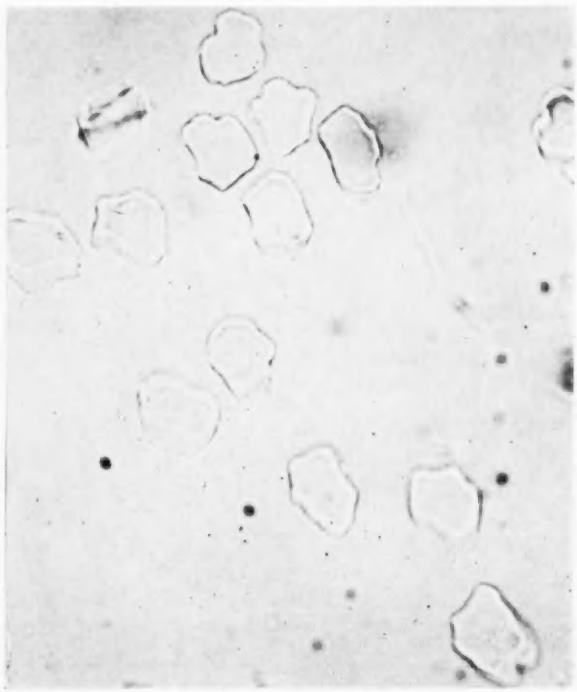


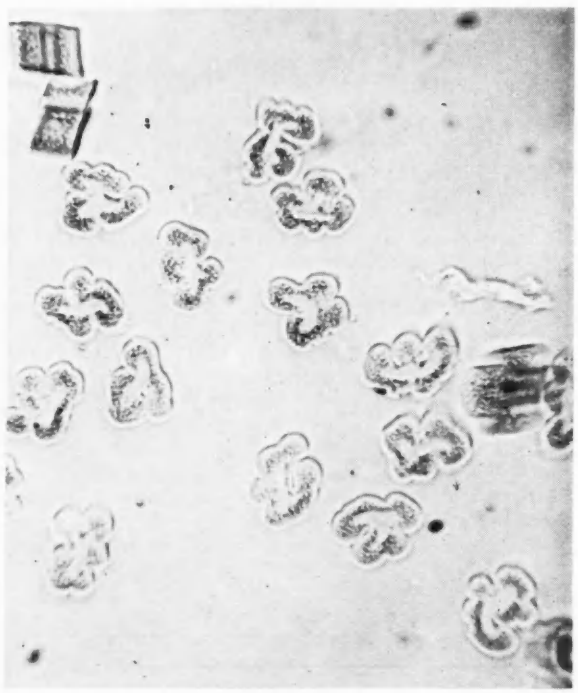
Figure 11
Comparison of Additive Functions.
A. Pineo formula $(1-b)^2/2b = 4.457\ c + 0.143$.
B. Selling formula $(R_w/R - 1.1)^{1.1} = 5.73\ c$.
Points are experimental data for Alizarin Direct Blue A2G (Pr. 10) on wool at 545 mu.
The Pineo and Selling formulas are adjusted to coincide at 10% reflectance with the empirical data curve.
The symbols used in the above formulas have the following definitions—
b = R — 0.01.
R = unit reflectance of dyed sample.
c = dye concentration (% dyeing).
R_w = unit reflectance of undyed sample.

very closely alike over most of the concentration range. At very low dye concentrations on wool, however, the Selling formula fails to agree with our data, whereas the Pineo formula continues to follow our data. This calculation of the Pineo formula for Fig. 11 was based upon letting s = 0.01 and n = 1. A slightly better fit could be obtained by varying the values of these constants slightly, but the data already fit the curve so well that there is little need to seek further improvement.

As is pointed out correctly by Preston and Tsein, there are many factors which



A. Round



B. Serrated

Figure 12
Cross-Sections of Two Types of Viscose*
These and other physical factors alter the constants in the Pineo formula.

* Cross-sections prepared by Dr. C. Maresh.

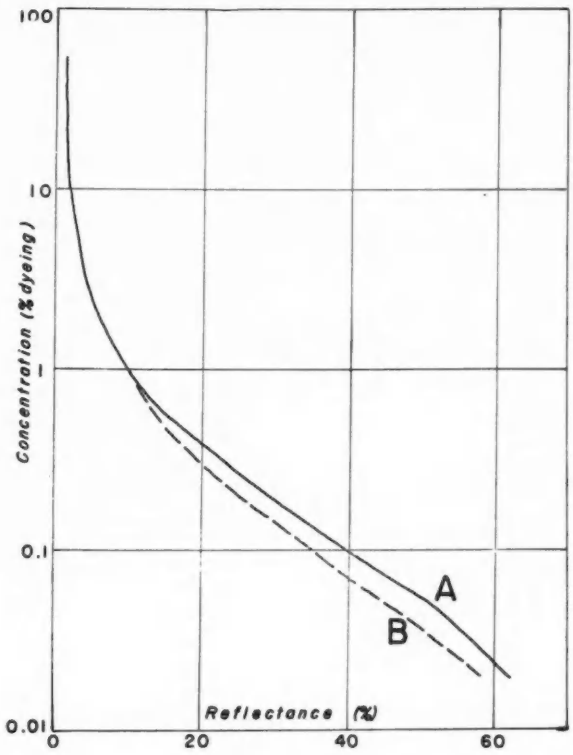


Figure 13

Additive Function for Cotton Dyes

A. Curve for vat dyes on cotton skeins.
Based on the average of six vat dyes at six different concentrations and four different wavelengths. The dyes used were:

Caledon Jade Green	(C.I. 1101)
Indanthrene Dark Blue BO	(C.I. 1099)
Indanthrene Yellow G	(C.I. 1118)
Indanthrene Golden Orange 3G	(Pr. 290)
Indanthrene Red RK	(C.I. 1162)
Indanthrene Violet BN	(C.I. 1163)

B. Curve for direct dyes on cotton skeins.
Based on the average of five direct dyes at ten different concentrations and three different wavelengths. The dyes used were:

Diamine Black BH	(C.I. 401)
Direct Deep Black EWEx	(C.I. 581)
Direct Deep Black RWEx	(C.I. 582)
Benzo Blue BB	(C.I. 406)
Benzo Fast Scarlet 4BA	(C.I. 327)

affect the shape of the R vs. C curve as shown in Fig. 11. These variations make it necessary to include the constants in the Pineo formula. Figures 12A and 12B show the cross-sections of two different types of rayon. A has a smooth surface, is round in shape, and when dyed shows a uniform coloration over the entire cross-section. B has a deeply serrated surface and the skin dyes definitely lighter than the core with some dyes such as Diamine Sky Blue FF (C.I. 518). One effect of this is to require a different value of a in the Pineo formula. A second effect is to require a different value of k, thus showing the "k" is not a function of dye only. Unexpectedly the value of n is the same, slightly greater than 1, for both rayons and the value of s is the same, 0.015 for both.

The value of s in the Pineo formula is greatly influenced by weave. It can be made as small as 0.001 by some pile fabrics or as high as 0.030 by some satin weaves.

Fig. 13 shows the relationship for vat dyes and direct dyes on cotton skeins. For vat dyes the value of n in the Pineo formula is approximately 1.0, but for direct dyes the value of n is significantly smaller. This difference on the same substrate is probably caused by fiber anisotropy and resultant dichroism. Vat dyes on cotton are not oriented *(2)* as contrasted with direct dyes on cotton, which are oriented *(5)*. There are, of course, many other factors that influence the shape of the curve, among which may be mentioned fiber selectivity and moisture content. Even the Pineo law begins to fail at such heavy concentrations that bronzing occurs.

There is, however, little advantage in having a mathematical formula to fit the data. The empirical relationship has to be determined for the case of interest anyway, and this empirical relationship can be used for strength determinations whether there is or is not a mathematical formula derived which is equivalent to it. Empirical relations should be determined for vat dyes on cotton or chrome colors on wool flannel or whatever other types of dyes and fabrics are of interest, and strength interpretations can be made from these empirical curves.

In conclusion, the word "approximate" must still modify any stated relative strength when there is a shade difference between the sample and the standard. In addition, the exact conditions of test must be specified if the samples being compared are chemically different.

SUMMARY

If two dyes do not differ in shade, their relative strength can generally be estimated visually to the nearest 5%. In this evaluation better precision is obtained by making two dyeings of each rather than one dyeing of one and three of the other. Blue dyes are more easily evaluated than yellow dyes because a concentration change in the blue dye usually has a greater effect on the reflected light. Special techniques to improve the precision of strength readings to 1% involve combination dyeings with other dyes.

If two dyes do differ in shade, strength comparisons are only approximate, as colorists will disagree. Colorists tend to underestimate the amount of real dye present if there is an additional dulling component present. Reflection curves of dyeings can probably be made to give the strength of off-shade dyes, but first it will be necessary for the colorists to agree so that spectrophotometric data can be correlated with visual data.

Some factors other than shade differences that affect strength estimates are the kind of fiber, the method of dyeing, and the concentration of dyeing. There are two separate factors which influence "build-up" in dyeing: one is a variation in percentage exhaustion with concentration, the other is a colorimetric factor, which involves the shape of the spectrophotometric curve of the dye.

Spectrophotometric evaluation of strength of dyes that do not differ in shade can be carried out by use of the Pineo modification of the Kubelka and

Munk formula, which relates dye concentration on the fiber to reflectance of monochromatic light.

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Pacific Southwest Section Meeting Report

THE Pacific Southwest Section held its regular technical meeting and dinner at 7:00 P.M., April 28, 1950, at the Los Angeles Athletic Club in Los Angeles, California.

During a short business meeting, Stewart Bone, Chairman of the Section's Nominating Committee read the proposed slate of officers for the year 1950-51. The following were elected by a majority vote.

Chairman—Russell B. Coleman, National Dyeing & Finishing Corp., Culver City, Calif.

Vice Chairman—Henry E. Salomon, United Piece Dye Works, Los Angeles, Calif.

Treasurer—Leon F. Olsen, Ciba Company, Inc., San Francisco, Calif.

Secretary—David F. Driscoll, Sandoz Chemical Works, Inc., Los Angeles, Calif.

Sectional Committee—Dr. Eli Lurie, Fred H. Haselhorst, Leonard G. Girling.

Councilor—Clarence Schreur.

The speaker of the evening was H. C. Borghetty, Technical Manager, Textile Chemical Division, General Dyestuff Corp., who spoke on "Trends of the Textile Industry."

The attendance was approximately sixty members and guests.

Respectfully submitted,

F. L. WILHELM, *Secretary.*

Photo by Kenneth C. Everett

Dr. Hans Luttringhaus, Chief Textile Chemist at General Dyestuff Corp. (right) shows Peter G. Kolupaev, Section Vice-Chairman, "something new" in yarn dyed blankets afterwards bleached, at a recent Rhode Island Section Meeting.

Dr. Luttringhaus Speaks at R. I. Meeting

DR. HANS LUTTRINGHAUS was the feature speaker at the Rhode Island Section meeting held on April 28 at the Providence Engineering Society Hall. He spoke on "Current Methods of Wool Dyeing". A baseball film, "The Making of a Yankee" with narration by Mel Allen followed. (Judging from the film's reception a number of Red Sox fans were in attendance).

Peter G. Kolupaev, Vice-Chairman of the Section, presided in the absence of Elliott Broadbent, Chairman.

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Initial Southeastern Section Outing

MEMBERS of the Southeastern Section are planning a summer outing to be held at Radium Springs, Ga., on June 9th and 10th. This is the first occasion of this sort to be held by the Section, and plans are made to have a full schedule of fun and entertainment for all guests, including ladies.

Registration will begin Friday at noon, June 9th.

A golf tournament is scheduled for Saturday morning, but those who wish may play Friday on the 18-hole championship course. Prizes will be awarded the winner of each flight of golf. A horseshoe tournament will be conducted Saturday, and prizes will be given to the winners competing in this sport.

Plans for the ladies include sight-seeing trips, card games, sun bathing, fishing, swimming, luncheons, badminton, and tennis. Favors will be given to the ladies, and prizes offered to the winners of the contests will be impressive. Saturday evening there will be a free social hour and party. An elaborate smorgasbord has been planned to follow the social hour, and an orchestra has been secured to furnish music for a dance to follow the banquet. The outing is to be concluded at noon on Sunday.

Radium Springs is located four miles south of Albany, Ga.

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Piedmont Section Completes Outing Plans

PLANS are now complete for the Section's Annual Myrtle Beach outing to be held this year June 30-July 2 at the Ocean Forest Hotel. J. C. Whitt heads the Outing Committee. Reservations should be made direct with the Ocean Forest Hotel.

A special luncheon for the ladies will be held Saturday, as this affair proved so enjoyable last year. Art Thompson is set to help with this occasion.

Hudson-Mohawk Section—

THE FIELDEN DRIMETER*

JOHN VARLEY

Fielden Electronics, Inc.

The Fielden Drimeter, introduced to the textile industry in England in 1947, measures the percent moisture content of piece goods continuously by measurement of the dielectric constant of the goods as they pass between two fixed electrodes.

The Fielden C2 Automatic Control is a relay control unit, which is actuated by the voltage of the Drimeter. The Automatic Control is used to control the speed of a dryer automatically so that goods leave the dryer with a desirable percent of moisture. The control of speed is so arranged that overcorrection and hunting do not result.

THE equipment I shall describe was developed in Great Britain and was introduced to the textile industry in 1947. In May of 1948 it made its debut in the United States. There are to date over 1500 Drimeters in use in more than 500 textile firms throughout the world. It should be explained that the engineers who developed the Drimeter are closely connected with the textile industry and are intimately acquainted with textile processing problems.

It is a natural law that any variation in the moisture content of a hygroscopic material is accompanied by a change in its electrical properties. While other indirect methods have been suggested for the determination of moisture in textiles, as for example, a measurement of the relative humidity of the air in the immediate proximity of a material, direct electrical methods claim first attention.

The change in electrical properties due to variation in moisture content are as follows:

1. A change in the electrical resistance of the material.
2. A change in the dielectric constant of the material.

Successful moisture indicators have been designed for a variety of materials employing either one or both of these changes. In the case of textiles, however, the problem is not capable of simple solution. Instruments designed to use change in resistance are limited, first, to the necessity of establishing good electrical contact with the fabric under test and, second, by the widely varying resistance resulting from the presence of dyes, fillers and substances of varying pH value from finishing operations.

Our method of moisture detection, which depends upon change in dielectric constant, needs no contact with the moving fabric and is not affected by dyes and finishing chemicals. Furthermore, variations of pH value in fabrics have only a minor effect on calibration accuracy.

The sensitivity of the Drimeter is understood more clearly when you note that the dielectric constant of water is 81, while that of cotton cloth is about 4. You will see from this that a 10-percent change in mass of cloth amounts to less than ½-percent change in instrument indicator reading. The indicator is, for most applications, marked "Dry to 20%" moisture content in 1 percent increments.

The fabric passes between two plates, protected by outer guard rings. The plates constitute the electrical capacitor that acts as the measuring probe. This capacitor is supported by a rigid casting. The guard rings, shaped to facilitate the entry of fabric, protect and restrict the electrostatic field to the sensitive inner plates. The guard rings further protect the inner plates from external interference. Coaxial radio-frequency cables 10 ft. long connect the electrode head to the Drimeter. Cables up to 30 ft. are also supplied where necessary.

The electronic measuring equipment has been designed to meet the following specifications:

1. It must be simple to operate.
2. It must be electrically stable; and it must be immune from electrostatic charges on the running sheet and from variations in line voltage.
3. The calibration of the instrument must not be adversely affected by tube aging.
4. It must be capable of giving continuous service under industrial conditions, even with occasional misuse of controls.

After almost 3 years of industrial experience, it may be stated that the confidence placed in the original design has been justified, and that the instrument's

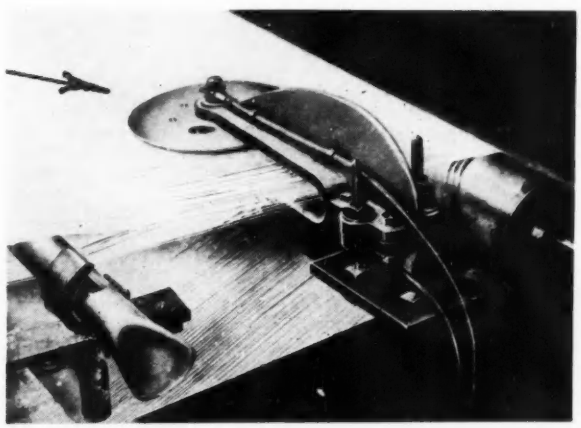

Figure 1
Electrode Mount on a Cotton Slasher

* Presented before the Hudson-Mohawk Section, at Albany, N. Y., January 18, 1950.

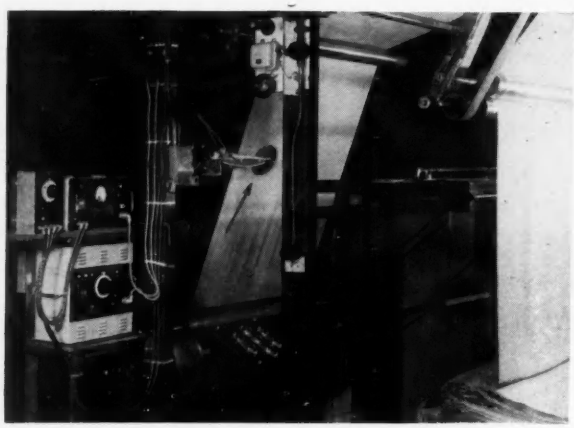

Figure 2
Automatic Control on a Tenter Frame

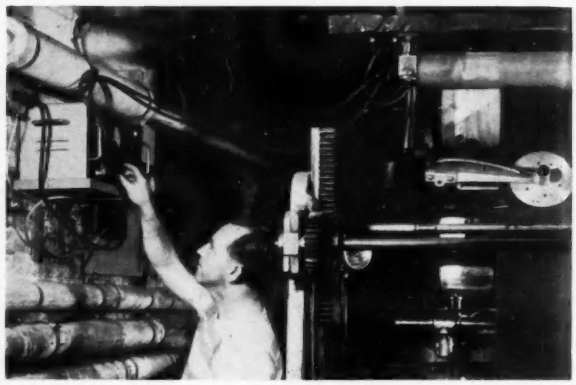

Figure 3
Electrode Mount on Tenter Frame Adjustable to Different Cloth Widths

performance and reliability have fulfilled the specifications. Tube life has been exceptionally long. Original tubes are often found satisfactory for further use even after having been in continuous day-and-night operation for more than a year.

AUTO CONTROL

We see, then, that the meter really measures an electrical voltage directly related to moisture content in a fabric. The operator could maintain the output of the dryer at the correct moisture level by control of speed and temperature with the information given by these voltage readings. However, if we want to use this information to full advantage we can remove this responsibility from the operator and feed this information into the Fielden C2 Automatic Control.

The problem of automatically controlling a drying plant is complicated by the delays inevitable between any correction in speed or temperature and the effect of that correction on the finished cloth. It will be readily understood that, if a correction in speed were to be continued until the moisture content was corrected, the result would be a large over-correction, and the machine would constantly hunt. Similarly, if the corrections were made at fixed intervals of time, there would be only one speed of the machine at which this interval would be correct.

The C2 Automatic has been designed to meet the following specifications:

1. It must meet the same specifications as the Drimeter.
2. It must make changes in speed that are proportional to error, i.e., it must make a large correction if the error is large and a small correction if the error is small.
3. It must ignore all damp sewings, and the usual local irregularities in moisture content in woven or knitted fabrics. The readings, therefore, must not be snap readings, but must result from an integration over a period of 2 or 3 seconds.
4. If a machine has been stopped for some time, a considerable length of material is overdried. When the machine is restarted the control must make no corrections until the overdried material has passed from the dryer.
5. The interval until correction is effected must vary with the changes in speed of the machine, being longer when the machine is running slowly and shorter when the machine is running fast.
6. Finally, the control must become inoperative if the machine is stopped or runs out of material.

In order to meet these requirements, the two following variables are fed into the Auto Control Unit:

1. Drimeter voltage, which varies in proportion to moisture.
2. A voltage proportional to machine speed, derived from a small alternator driven from some moving shaft of the dryer, or derived by some other suitable method.

The required moisture content is determined by setting the main dial of the instrument, and the working tolerance is adjusted by the smaller control. A switch enables hand or automatic operation to be selected at will. Push buttons are provided for hand control.

The tolerance control can be set ordinarily to give a working tolerance of plus-or-minus 1 percent of moisture content. In the case of an unevenly woven fabric, the amount of drying fluctuates with the unevenness, and a wider working tolerance must therefore be allowed in the operation of the Unit Control.

It is important to appreciate that momentary fluctuations of the Drimeter indicator are of little consequence, as the Control Unit monitors an output at any desired average moisture level.

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Report of LTI Student Chapter Meetings

AT the April 5 meeting of the Lowell Textile Institute Student Chapter complete reports for the college year were read by Joan Gregg, Treasurer, and by the Program Chairman, Leo Labrecque.

On Friday, April 21 the Chapter held its annual joint meeting in conjunction with the Northern New England Section. This featured a garment display showing the effect of dry cleaning on various types of fabrics which was set up in Southwick Hall. The display was arranged by Therese Commerford and an assisting committee under the guidance of Chairman Rebenfeld. Supper was served at the Institute cafeteria, after which those present were invited to adjourn to Eames Lounge. At 8:00 P.M., Charles Trommer of the LTI Graduate School presented a paper entitled "A New Method of Measuring Penetration and Wetting".

At the final meeting of the college year on May 3 the officers of the Student Chapter for the next year were elected, as follows:

Chairman—Robert W. Sumers.
Vice-Chairman—Samuel A. Wood.
Treasurer—John J. Kelleher.
Secretary—Alfred J. Richard.
Asst. Secretary—Joseph A. Roux.

Chairman Rebenfeld extended his thanks to the officers and members of committees who worked with him throughout the past year.

The next meeting of the Student Chapter will be held soon after the opening of the September college session.

Respectfully submitted,
DOROTHY A. McCARRON, *Secretary.*

Hudson-Mohawk Section—

MOISTURE CONTROL IN FABRIC DRYING*

DAVID S. BUNCH, JR.
Fielden Electronics, Inc.

The use of a Fielden Drimeter, either alone or in combination with a Fielden C2 Automatic Control Unit, is discussed with respect especially to the cost of dryer operation and the quality of dried textile materials in textile manufacture. The use of these instruments in slasher operations is explained.

I HAVE chosen as my title for this discussion "Moisture Control in Fabric Drying." Of course I realize you gentlemen know much more about cloth than I do; my work is mostly in electronics. But, having spent the past year calling on textile mills and finishing plants, working on nothing but this subject, I am here to present some of my observations, which I hope may be of interest.

Mill experience has undoubtedly led you to appreciate that lack of consistent drying could explain lack of consistency in finishing and weaving operations. Lack of equipment to give a continuous picture of drying operations, however, has forced the mill man to abandon the study of moisture variation for more pressing matters.

In the Drimeter we have the tool we need to find out what is happening in drying operations. Briefly, the Drimeter consists of the instrument, a little larger than a table-model home radio, and the electrodes, which are attached to the instrument through flexible coaxial cables. Basically, the electrodes are two metal discs about 4 inches in diameter, held to a fixed spacing by a rigid casting. The cloth passes between these metal discs. The electrodes are installed after the dryer and before the batching machine. The instrument is placed at a convenient location where it may be adjusted and observed by the dryer operator.

The operation of the Drimeter is comparatively simple. It consists merely of adjusting the one knob on the front panel of the instrument until the indicator hand reads "dry" at the beginning of each run of fabric while "oven-dry" cloth is being delivered from the dryer. After this one adjustment, which requires only a few seconds, the dryer is speeded up or the dryer temperature is reduced until the indicator hand shows that the desired moisture level has been reached. The dryer operator should be taught this procedure as early as practicable.

We have found that for general drying operations fabrics should be dried somewhat drier than the normal regain value accepted for a 65-percent relative humidity and a 70-degree temperature. The reason for this is that mill-floor conditions of relative humidity and temperature are different from laboratory conditions. In general, cotton should be dried to a moisture content of about 5 percent, wool about 10 percent, acetate 4½ percent and viscose rayon about 8 percent. If you take samples out of the plant that have been there long enough to reach equilibrium, you will find that the moisture values are very close to these percentages. When material is dried to these moisture levels, it will be at equilibrium and ready for future processing, regardless of storage time. On the other hand, if a roll of fabric is bone-dried, and left over a week end, it picks up moisture on the selvage and outer surface. Then the greater moisture content of the selvage and outer parts causes these to take a different finish from the center. Also, the absorbency for dyes or finishes is not uniform from selvage to center if the material has been originally bone-dried.

Another important aspect in drying fabrics only to the normal regain percentage, as opposed to bone-drying, is the matter of the temperatures to which the fabric is subjected. Regardless of dry-box temperature, the fabric inside the dryer cannot exceed 212 degrees so long as it contains more than its normal amount of moisture. As an illustration, in drying cotton in a 300-degree dry box from wet to a moisture content of 7 percent, the temperature of the cloth is never above 212 degrees; at 5 percent the temperature reaches about 220 degrees (this has no harmful effect); but at 2 percent the temperature is close to 280 degrees, and at bone-dry the temperature reaches 300 degrees. Such high temperatures tend to bake the fabric, driving off the natural oils and producing a finished product with a much poorer hand than possessed by fabric that has not been subjected to this baking. Baking can also drive off finishing materials. One bleachery has equipped all of its tenter frames with Drimeters, because overdrying was driving the bluing out of its white finished cloth.

In the case of rayons and acetates this overdrying and the subsequent overheating of the fabric results not only in the loss of proper hand, but often in the evaporation of expensive finishing materials. I have visited any number of plants where the whole vicinity of the dryer was permeated by a haze of blue vapor; this vapor was the finishing material. When the Drimeter was installed and the dryer was speeded to leave the proper amount of moisture, the condition was rectified. I might add that it is often necessary to reduce the proportions in the finish mixture to insure the desired reaction in the calenders.

In woolens the effects of overdrying are much more generally recognized; hence the operation of woolen dryers at a much lower temperature, with subsequent loss of production. By a continuous indication of moisture content, wool-dryer temperature can be materially increased with no damage to the fabic, if the dryer is operated at a speed to deliver the fabric at about 10-percent-moisture content.

You may be surprised at my glib use of the term "bone-dry" or should I say "oven-dry". But the most astonishing thing that we have discovered is the number of dryer operators who persist in operating dryers too slowly. In case after case the Drimeter has shown bone-dry fabric being delivered. And in a large number of these it has been necessary to increase dryer speed from 10 to 20 percent before the instrument showed the presence of any moisture at all.

It is not altogether fair to blame the operator for this condition. The trend in all American industry is toward higher production. In drying we see faster and faster machines with higher and higher temperatures. But the pressure on the op-

* Presented before the Hudson-Mohawk Section, at Albany, N. Y., January 18, 1950.

erator is toward playing safe by having the cloth "good and dry." If he allows wet cloth to pass he is answerable to either the dyer or calendar operator. Referring to the temperatures of cloth in dryers, which I just mentioned, the operator feels the cloth for high temperature as a gauge to proper drying, and the result is bone-dry fabric. If we take cotton as an example, only an unusually skilled operator can tell by the feel of warm cloth whether the moisture content is 3 percent, which is too dry, or 8 percent, which is often too wet; and, since management has no quick means of determining the actual moisture content, the operator in most cases keeps the speed well on the slow side. I might add that the slower the dryer is run the lower will be the production.

The points I have just mentioned refer to general drying. The field of special finishes at closely controlled moisture levels offers unlimited possibilities for research. Glazed chintzes, toweling and grain bags are diverse examples of textiles for which the Drimeter is now applied. In rayons we have had cases where drying to the proper moisture level has eliminated the subsequent operations of steaming and calendaring.

So far I have tried to cover moisture content from the point of view of quality control. Now I would like to cover the economic side of the question.

In many finishing plants the cost of the various drying operations is the greatest single expense in processing cloth. In my experience, very few dryers are efficiently controlled; most dryers are operated much too slowly, some too fast, with the result that a second handling of the fabric is required. In some types of finishing where weight of the finished cloth is the basis for computing charges, moisture content is a constant problem. The cost of redyeing to a darker shade in cases where shading off is caused by uneven moisture is difficult to calculate. The cost of reconditioning fabric which has been overdried is often a substantial item. The direct savings in steam and labor through operation of dryers at the proper speed will often repay in a matter of months the approximate cost of $900.00 for the Drimeter alone or of $1,900.00 for Drimeter with automatic-speed-control unit. In many installations the Drimeter has permitted increase of dryer speeds from 10 percent to 30 percent; in some cases to almost 100 percent. If we assume that a dryer is operated with a daily payroll of $20.00 and dries 5,000 pounds of cloth, a 10 percent increase in production will turn out 5,500 pounds of cloth with the same payroll. The saving amounts to about $2.00 per day. At an increase of 30 percent in speed the dryer will turn out 6,500 pounds of cloth. Then the saving amounts to about $6.00 per day. These savings do not take into account the considerable investment in the dryer, which should be prorated over each yard processed. Also, larger dryers process many times 5,000 pounds in a day.

The second economy afforded by moisture control is the saving in steam. In bone-drying material we are needlessly evaporating at least 5 pounds of water for each 100 pounds of dry cloth. This 5 pounds of steam represents about 8 pounds at the boiler room when we take into account losses of steam in the dryer, steam mains and boiler house.

In one of New Jersey's leading bleacheries the company officials reported their first 5 Drimeters had enabled them to maintain moisture regain to within 1 percent of accuracy on tentered goods. Output on the 5 frames was stepped up 25 to 30 percent. A saving of 32 machine hours a day repaid the cost of the investment in a few weeks. Their labor savings amounted to $400.00 per week. Eight employees could be transferred to other departments as one shift of frames was eliminated. The officials further stated that labor savings alone repaid the original investment in Drimeters in 10 weeks.

The plant has used 20,000 pounds a day less steam since the moisture indicators have been in operation. If steam costs this company 60 cents per 1,000 pounds, there is a saving of $12.00 a day. At this rate the Drimeters will pay their way in steam savings alone in a little over a year.

So far I have confined my talk to finishing because, as I said before, the electrical principles employed by the Drimeter are the first that have enabled the accurate control of moisture in finishing operations. However, another large field for moisture control is in slashing. In this field several moisture meters and speed controllers have been available for years, which have done a reasonably good job on all but acetate and worsted warps.

In slashing, beside the advantages of increased production and steam savings, drying to a controlled moisture content will add to weave-room efficiency. With uniform moisture, yarn tension will remain uniform and the yarn more pliable. When the yarn is overdried it becomes brittle and more breaks are encountered in the looms.

The institution of moisture control can, at times, become a somewhat complex affair. It often involves doing things differently from the way they have been done in the past. Opposition to instrumentation is sometimes encountered.

The Fielden Drimeter, or the Drimeter with automatic control unit, is, in our opinion the best available, but as the finest automobile has to be driven, so the Drimeter has to be operated. However, I have seen moisture control accomplish such gratifying results in so many plants, that I can honestly say it warrants a fair trial. Besides the advantages of steam savings and increased production the intangible results of improved handle of the cloth, better drape, more luster, greater tensile strength, better wear resistance and greater uniformity of finish, place a plant in a favorable competitive position.

CALENDAR

COUNCIL

Meetings: June 9 (Montreal, Que.) Sept. 28-30 (Portsmouth, N. H. Convention) Nov. 17 (New York).

NATIONAL CONVENTIONS

1950: September 28 to 30, Portsmouth, N. H.
1951: October 18 to 20, Statler, New York.
1952: Boston.

HUDSON-MOHAWK SECTION

Meetings: June 23 (Annual Outing, Shaker Ridge Country Club, Albany, N. Y.), Sept. 15 (Albany), Oct. 20 (Utica), Dec. 8 (Albany), Jan. 19, 1951 (Albany), Mar. 16, 1951 (Albany), May 11, 1951 (Albany), June 22, 1951 (Annual Outing).

MID-WEST SECTION

Meeting: June 17 (Annual Outing, Lake Lawn Lodge, Delavan, Wisc.), October 28 (Chicago, Ill).

NEW YORK SECTION

Outing: June 16.

Meetings: Sept. 29 (Swiss Chalet, Rochelle Park, N. J.), November 17 (Swiss Chalet), Jan. 12, 1951 (Hotel New Yorker), Feb. 23, 1951 (Hotel New Yorker), March 30, 1951 (Swiss Chalet), May 4, 1951 (Swiss Chalet), June 15, 1951 (Outing).

NORTHERN NEW ENGLAND SECTION

Meeting: June 9 (Merrimac C. C., Methuen, Mass.).

PHILADELPHIA SECTION

Meetings: June 9 (Annual Outing, Torresdale-Frankford Country Club, Philadelphia), October 28 (Meeting-in-Miniature, Philadelphia Textile Institute), December 8, January 17, 1951.

PIEDMONT SECTION

Meetings: June 30-July 2 (Ocean Forest Hotel, Myrtle Beach, S. C.), October 28 (Charlotte, N. C.)

RESEARCH COMMITTEE

Meetings: June 9 (Montreal, Que.), Sept. (Portsmouth, N. H., Convention), Nov. 17 (New York).

RHODE ISLAND SECTION

Meetings: October 27 (Providence Engineering Society Hall), November 17 (Johnson's Commodore Room).

SOUTH CENTRAL SECTION

Meetings: August 18-19 (Summer Outing—Read House—Hotel Patten, Chattanooga Country Club—Chattanooga, Tenn.).

SOUTHEASTERN SECTION

Meetings: June 9-10 (Outing, Radium Springs, Ga.), September 23 (LaGrange, Ga.), December 9 (Atlanta, Ga.).

WESTERN NEW ENGLAND SECTION

Meetings: June 23 (Outing at Wallingford, Conn., Country Club).

ONE HUNDRED AND SEVENTY-FIRST COUNCIL MEETING

THE Council held its 171st meeting in the Hotel New Yorker, New York, N. Y., on Friday morning, April 14, 1950. Present were President C. Norris Rabold, presiding; Arthur W. Etchells and George O. Linberg, Vice Presidents; William R. Moorhouse, Treasurer; J. Robert Bonnar, Chairman of the Research Committee; William D. Appel, William H. Cady, Carl Z. Draves and P. J. Wood, Past Presidents; John M. Gould and C. Wendall Lever representing Northern New England; Edward J. Allard, Raymond W. Jacoby, James A. Stevenson and George H. Wood representing Rhode Island; Charles W. Dorn, Herman E. Hager, William A. Holst, Jr., Paul J. Luck and Herman E. Wilde representing New York; James Dixon, Walter F. Fancourt 3rd, Morris T. Klein, Frederick V. Traut and Jackson A. Woodruff representing Philadelphia; Raphael E. Rupp, Henry A. Rutherford and Sumner H. Williams representing Piedmont; Joseph H. Jones representing Mid-West; Harold H. Taylor representing Western New England; Albert E. Herrmann, Jr., representing Hudson-Mohawk; Kenneth H. Barnard of the Convention Committee; George L. Baxter of the Corporate Membership Committee; Arthur E. Hirst; Leonard S. Little of the President's Advisory Committee; J. Edward Lynn; W. George Parks of the Technical Program Committee; George H. Schuler of the Publicity Committee; Edwin I. Stearns of the Color Committee; Harold W. Stiegler, Research Director; Percival Theel of the Publications Committee; and Harold C. Chapin, Secretary.

The Secretary's report of the 170th Council meeting and financial report of April 5 and the Treasurer's report of April 6 were accepted.

The two amendments to the Bylaws proposed at the January meeting were reported adopted by letter ballot. The appointment of Mr. Holst to replace the Treasurer as a member of the Committee on Constitution and Bylaws, and the election of J. N. Dalton, W. M. Scott and J. A. Stevenson to the Executive Committee on Research were thus confirmed.

The following proposals for amendment to the Constitution were presented with approval of the President's Advisory Committee and the Committee on Constitution and Bylaws. Councilors were requested to consult their Sections and give their opinions at the next Council meeting. The proposals will be submitted to letter ballot of the entire Senior membership of the Association in October. They are as follows:

In Article V, Section 2, of the Constitution, change "two Vice-Presidents" to "four Vice-Presidents."

In Article VI, change to the following:

Section 1. Nominations for the offices of President and four Vice-Presidents shall be made each year by a Nominating Committee consisting of the Councilors representing Sections. The Secretary of the Association shall serve as Secretary of this committee, but without vote. One or more nominations by this committee for each of the five offices to be filled shall be published in the Proceedings of the Association not later than September first.

For the office of President, nomination shall be by majority vote, or successive majority votes, of the entire Nominating Committee. For the nomination and election of Vice-Presidents, the Sections of the Association shall be grouped geographically into four Regions defined in the Bylaws. Nomination of candidates for the office of Regional Vice-President shall be by majority vote, or votes, of the Nominating Committee members from that Region.

Section 2. Any additional nomination for President, signed by at least fifty Senior members, or for Regional Vice-President signed by at least twenty-five Senior members of that Region, may be filed with the Secretary not later than October first.

Section 3. The Secretary shall mail to each Senior member by October tenth a ballot bearing the name of every nominee for President, and of every nominee for Vice-President from that member's Region. Ballots marked and returned within six weeks of mailing shall be counted within one week thereafter by the Secretary and two tellers appointed by the President. To each office that candidate receiving the largest number of votes shall be declared elected.

If two or more candidates for President lead with equal numbers of votes, then ballots naming these candidates shall be mailed by the Secretary, within three days, to all the members of the Council representing Sections. On ballots returned to the Secretary within three weeks of mailing, the largest number cast for any one candidate shall determine the election. If two or more candidates for the same Regional Vice-Presidency lead with equal numbers of votes, a like procedure shall be followed, except that voting shall be confined to the Council representatives from that Region.

The results of election shall be published by the Secretary in the next available issue of the *Proceedings.*

A change in the name of the Merchandise Committee to "Committee on Technical Supplies" was approved by the meeting and submitted to letter ballot.

Mr. Bonnar reported that the enlarged Executive Committee on Research had held two meetings, and gave promise of improved efficiency through broader assignment of responsibilities. The Research Committee meeting in Montreal would be condensed to presentation of a few of the more interesting reports. A literature survey on continuous bleaching, compiled by the Advisory Committee on Research of the New York Section, would be published in the *Reporter,* and would subsequently be available in reprints. A Committee on Continuous Wool Scouring had been organized.

It was voted that the German committee on dye fastness be permitted to sponsor manufacture of Crockmeters in that country on the same basis as national organizations in other countries, namely adherence to our standard of quality, and acknowledgment of our design.

Under the auspices of the Research Committee had been organized a Committee on Vocational Training headed by P. J. Wood, with objects described to the meeting by Mr. Wood. The first of a series of elementary manuals for mill workers would be written this summer, on applied mathematics and physics.

For the Publications Committee Professor Theel reported that Dr. Draves had begun editing the *Proceedings* for the *Reporter,* and with Mr. Cady and Mr. Jacoby would constitute a committee on technical spellings. Rules for the American Dyestuff Reporter Award were offered and approved, and will appear in full in the *Reporter.* The prize of $200 will be given to the author of the paper, published originally in the *Proceedings,* judged best by the Publications Committee; excepting Intersectional Contest Papers, and work sponsored by the Association financially or through research committee assignments. It was voted that the first award be made at the convention of 1951 on a paper published in the year beginning July 1, 1950. A cumulative index, for ten years or more of the *Proceedings,* was under consideration, per-

haps under auspices of the Research Committee.

Mr. Cady reported that questionnaires were coming back with information for the *Colour Index*. The contract for publication was still under discussion by attorneys. Progress on the *Year Book* promised publication according to schedule in August.

The President announced appointment of Joseph Lindsay, Jr., H. C. Chapin, T. R. Smith, G. H. Wood, Jr. and P. J. Wood as this year's Committee on Student Awards. P. J. Wood reported on plans of the committee.

Dr. Stearns discussed the Inter-Society Color Council Convention to be held in New York City in the spring of 1952, for which the Council voted cooperation in the exhibit and speaking program. As Chairman of the Committee on Color, Dr. Stearns is being succeeded by Frederick T. Simon.

Mr. Linberg and Mr. Baxter reported for the Corporate Membership Committee, and Mr. Luck on Publicity. Mr. Little reported the addition of J. N. Dalton to the President's Advisory Committee.

For the Convention Committee Mr. Barnard proposed the appointment of a committee, not exceeding six members, to run the convention of 1953, and to present a plan to the Council for running future conventions under national rather than local management. It was voted that the President recommend, and the Council appoint, such a committee. It was agreed that a questionnaire on the convention preferences of members be mailed by the Secretary to all Section officers. George H. Wood, Jr. described plans for the coming convention of September 28 to 30 in Portsmouth, N. H.; and Dr. Parks the Technical P-ogram.

It was recommended by Mr. Etchells, for the Committee on Membership and Local Sections, that Washington, Oregon and Idaho be assigned to the new Pacific Northwest Section, leaving the other states of the former Pacific Coast Section in the new Pacific Southwest Section. A letter from A. R. Thompson was received describing a recent joint meeting of the Piedmont Section with the Student Chapters of Clemson College and North Carolina State College, the principal feature of which was a competition between the Chapters in the presentation of papers for prizes. For the institution of this custom the Section and Chapters were voted the congratulations of the Council. It was reported that the Northern New England Section was about to be the guest, for the third time annually, of the Lowell Textile Institute Student Chapter, at a meeting arranged by the Chapter, with papers by its members.

Elected to Corporate membership were Atlantic Chemical Corp., Brook Chemical Co., Rutherford Dye & Chemical Co. and Standard Hosiery Mills, Inc. Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided no objection be received meanwhile by the Secretary.

SENIOR

E. Abrams
M. F. Aguilar, S.
D. B. Andrews
J. L. Ayres
H. W. Axe
K. D. Bacon
R. L. Beard
A. W. Bergeron
E. Berlinger
L. G. Boiko
R. Briganti
A. Brunett
S. J. Caforek
R. S. Cardoso
F. J. Cofer
R. Champion, Jr.
S. M. Chenier
S. Cohen
D. J. Collins
L. C. Conner
H. Conrad
P. T. Daly
G. A. Donnelly
H. A. Earle
J. L. Eich
C. F. Embody
R. J. Ericson
J. M. Evans
H. Finley
R. D. Fite
Z. Freeman
A. Frieden
C. A. Gambrell
R. B. Graham, Jr.
J. A. Greway
G. H. Hacker
G. P. Hahlweg
N. D. Hamel
H. D. Harries, Jr.
E. J. Hehir
N. J. Holmes
A. E. Horning
C. B. Hunsicker
F. Hyatt
W. R. Ivey, Jr.
V. R. Jensen
M. Jones
M. N. Jordan
J. F. Kalina
J. H. Karrh
S. A. Kaswell
F. W. Kennedy
M. M. Kuczek
D. J. Lambert
R. E. Langlois
P. P. Latkovich
D. W. Layton
K. A. Lewis
E. Lister
S. H. Loper, Jr.
J. Lubin
A. J. Ludwig
E. F. Lyons
W. L. Manning
A. J. Mapp
F. J. Massimi
H. W. McJunkin
J. T. McLaughlin
K. J. Moffitt
W. J. Moran
C. J. Mossman
W. J. Mottley
H. D. Muller
A. E. Neil,Jr.
T. M. Newton
R. G. Nieman
R. A. Olivet
C. F. Pack
E. A. Peck
P. P. Pepka
G. M. Perkerson
R. E. Pohle
M. Poster
W. M. Ray
G .W. Reynolds
L. Ricard-Tessier
J. Richardson
J. H. Riddle
R. W. Ross
F. J. Rowe
J. Satinsky
L. P. Seveno
L. E. Sicard
H. Sirooni
G. W. Smith
G. W. Smith
J. R. Smith
H. G. Sowers
W. C. Stewart
E. A. Stifel
F. S. Stover
H. G. Strong
F. A. Stuewe
A. A. Suffoletto
A. V. Sullard
A. W. Thomas
E. W. Thomas
B. G. F. Tornell
A. L. Troy
A. D. Truman
H. K. Vogel
H. A. Walker
R. Warner
D. H. Wehner
H. A. Weil
J. A. White
E. S. Whittier
I. J. Wolf
B. M. Young
K. T. Young

JUNIOR

D. J. Bartoluzzi, Jr.
R. H. Baumann
H. J. Baumeister
C. G. Bennison
J. A. Davis
R. E. Derby, Jr.
D. H. Fields
L. R. Greenwood
G. A. Heath
N. M. Hollis
J. E. Kerr
H. B. Kuntzmann
L. W. LeSter
J. E. Lira
T. D. MacLane
G. B. McCulloch
C. P. Moore, Jr.
L. W. Patriquin
R. P. Rhodes
W. E. Rooks
A. J. Rooney
L. B. Rosenblatt
P. M. Smith
J. E. Spearman
R. E. Townsend
R. L. Tribelhorn
J. Walton, Jr.
J. Wilson
V. Winkelman, Jr

ASSOCIATE

R. L. Alonzo
S. M. Anwar
F. P. Barrie
C. B. Bennett
M. Bobrow
H. G. Brown, Jr.
F. H. Buck
E. R. Chadwick
D. P. Collins
J. W. Cunningham
S. K. Dadabhoy
W. Dolder
R. K. Gilmore
J. T. Hall, Jr.
T. J. Hamilton
G. C. Harkins
M. Hayek
J. S. Magid
H. P. Mansfield
E. F. McCorsley
A. T. McDowell
H. H. Menefee
M. Menetto
D. A. Merchant
W. A. Munz
H. L. Pero
C. H. Ratterree, Jr
J. S. Savage
H. M. Smith
B. F. Vaughan
A. C. Waldron
H. O. Williams
D. L. Worth

STUDENT

D. H. Abrahams
E. Arnold
H. V. Atkinson
G. C. Aumick
H. A. Bailey
C. S. Baker, III
Hugh W. Barrow
G. L. Baxter
L. A. Bein
B. Blechman
R. M. Bonifazi
M. E. Boys
R. R. Brassard
G. M. Bryant
J. A. Caradonna
A. Cassetta
W. C. Champion
L. C. Cloninger
H. C. Cobin
W. M. Copley
H. J. Demas
G. J. Desmond, Jr.
G. Desnoyers
R. M. Ellis, Jr.
H. M. Fishman
G. H. Fisk
C. D. Flamand
M. H. Gladstone
R. M. Greenberg
B. L. Hinkle
C. F. Hughes, Jr.
E. E. Hutchison
J. S. James, Jr.
S. Kaplan
J. H. Kennedy, III
C. J. Kokron
W. Krier
E. Larrat, Jr.
J. Lashinsky
S. Lazarek
I. J. Lederman
L. J. Linker
R. J. Lynch
R. F. Miller
G. C. Morehouse
J. P. Morgan
A. D. Nacht
J. E. Norton
J. V. Nuzzolo
E. Ober

C. B. Palmer
R. Pensoy
E. Richlin
J. Sabatini
G. A. Scagos
V. J. Shanahan
R. A. Tegtmeier
T. E. Thomas
N. W. Touchette
L. Weissbein
H. Wilensky
R. L. Wilkey
W. O. Wilson
G. A. Wright, III
N. F. Young

Transferred to Senior Membership were:

R. E. Atkinson
G. E. Fleming
W. F. Gerrow, Jr.
F. E. Hilger
L. Tigler
R. A. Walsh
S. H. Wilson
G. W. Wright

Respectfully submitted,
HAROLD C. CHAPIN, *Secretary.*

SECRETARY'S FINANCIAL REPORT—APRIL 5, 1950

	Applications	*Dues, Regular & Reinstate*	*Dues, Corporate & Sustaining*	*Miscellaneous*	*Totals*
Received & transmitted to Treasurer					
August 1, 1949 to January 3, 1950	$2,543.00	$29,486.50	$22,775.00	$13,935.95	$68,740.45
January 3 to April 5, 1950	1,584.50	8,042.50	20,257.50	9,666.00	39,550.50
Totals in fiscal year to April 5, 1950	4,127.50	37,529.00	43,032.50	23,601.95	108,290.95
Leaving deposited by Treasurer with Secretary					5,215.70
Miscellaneous items					
Dividends & Interest					$ 744.85
C.W.S. contract					3,861.52
Textile Wet Processing Exhibition, for expenses					192.91
Philadelphia Section research fund					2,000.00
Multifiber cloth, royalties					141.60
Launderometer royalties					175.00
Gas fading units, profit					30.05
Reporters & reprints					61.95
Dry cleaning kit					3.00
Year Books					662.50
Crockmeters					563.50
Crock cloth					440.50
Moth cloth					111.50
Water test apparatus					90.60
Dyed standards					94.00
Knitted tubing					6.30
Buttons					8.00
Color transfer charts					87.00
Color Index					160.19
Analytical Methods					234.00
					9,668.97
Bank Charges					— 2.97
					$9.666.00

MEMBERSHIP ON MAY 1, 1950

Section	Senior	Junior	Associate	Student	Total 1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
Northern New England	443	40	78	6	567	545	550	556	528	469	402	407	398	391	349
Western New England	115	9	20	—	144	142	97								
Rhode Island	483	37	56	13	589	556	511	501	471	405	348	352	341	337	332
New York	1081	77	177	—	1335	1282	1285	1262	1167	1008	817	707	651	606	538
Hudson Mohawk	134	12	17	—	163	117									
Philadelphia	824	50	97	—	971	930	871	833	740	644	550	513	517	475	447
Piedmont	525	56	71	17	669	587	511	492	434	366	326	286	309	297	293
South Central	122	7	11	—	140	128	111	102	100	87	83	72	80	71	61
Southeastern	193	16	22	6	237	224	209	198	166	141	141	146	175	142	137
Mid-West	292	10	38	1	341	336	337	326	287	261	209	198	194	193	180
Pacific Northwest	32	1	2	—	35										
Pacific Southwest	68	2	13	—	83	115	81								
Student Chapters	—	—	—	421	421	312	240	142	50	14	20	56	117	80	59
Unclassified	251	19	87	12	369	340	286	286	237	199	151	122	82	87	80
	4563	336	689	476	6064	5614	5089	4698	4180	3594	3047	2859	2864	2679	2476
Corporate					295	300	300	299	302	299	184	82	77	33	33
Totals					6359	5914	5389	4997	4482	3893	3231	2941	2941	2712	2509

A.A.T.C.C. GENERAL RESEARCH COMMITTEE MEETING

THE 162nd meeting of the General Research Committee was held at the New Yorker in New York, Friday, April 14, 1950.

Chairman J. Robert Bonnar opened the meeting at 1:52 p.m. and reported to the group that the enlarged Executive Committee on Research is working well. He also reported that exhibit space for the research committee activities has been agreed upon at the forthcoming national convention at Wentworth. He also referred to the next meeting of the General Research Committee which is to be held in Montreal and stated that plans were being laid to have three or four chairman of subcommittees give reports of their activities. He announced that the accumulative index of the *American Dyestuff Reporter* has been proposed and that steps will be taken to secure the cooperation of Sectional Advisory Research Committees to take care of this task. Reference also was made to the recently completed literature survey on continuous bleaching which will shortly be published periodically in the *American Dyestuff Reporter.* Reference was also made to the fact that available quarters for our activities at Lowell have been somewhat decreased and that, therefore, our activities will be a bit cramped for the next six to eight months. Mr. Bonnar then turned the meeting over to Dr. H. W. Stiegler, Research Director.

ACTIVITIES AT THE LOWELL LABORATORIES.—The work for the Wash Fastness Committee is going well. The abrasion aspect of laundering has been completed, new containers have been specified, interlaboratory tests are under way and there remains only the development of the official method which will follow after the interlaboratory tests are completed.

With reference to the Accelerotor, this is also proceeding well, changes are about finished, and Dr. Stiegler advises that Atlas Electric will shortly make available what he called the finalized model. When

several of these are available further experimentation will be possible and it is expected that ultimately a standard method will be devised. He referred also to the fact that the principle of the Accelerotor appears to be of interest in other fields such as leather and paper.

The work on water repellency has been completed and the project will probably be closed out. This work consisted of a thorough study of nozzle delivery and a comparative study of the Mico and ITT nozzles. Dr. Stiegler mentioned that the detergency comparator has been formally accepted as a standard instrument but no standard procedure has as yet been set. The instrument is available from the manufacturer in Lowell and an article in the *American Dyestuff Reporter* will shortly give all details and answer all questions. He stated that the detergency comparator costs approximately $1,500.

REPORT OF FLAMMABILITY COMMITTEE.—Dr. Hager reported that considerable progress has been made at Lowell in connection with this program and that the report of the research associate in the *American Dyestuff Reporter* covering last year's work gives the detail of the progress at Lowell. Copies of this report were prepared and sent to the donors of funds who supported the work. It is concluded that the testing instrument as presently set up does a reliable job on flat fabrics. The situation on napped or chenille fabrics indicates that difficulties are connected with the surface characteristics of the materials, and that, therefore, the preparation of the surface is of primary importance. This factor is now being studied further. Lowell will make some minor changes in the rack and will develop a combing device which will probably be a nylon brush. After these changes are made and further testing has been finished, methods developed will be subjected to further interlaboratory tests. It is definitely expected that we may then be able to set up testing methods which are sufficiently reliable even for napped fabrics so that interested groups will find it possible to set up commercial standards based on our instrument and methods. Dr. Hager referred to the fact that more than fifty of our testers are in use in industry and that their use has had a definite impact on fabric construction. Better fabrics are undoubtedly now available as a result of the work done with these instruments. C. W. Dorn made some general remarks in connection with the instrument.

Dr. Stiegler reported that the Executive Committee on Research had decided to cooperate with stream pollution activities when our assistance is requested. It appears that there is considerable interest in this activity at the present time and that we will be drawn into the matter in the future.

REPORT OF COMMITTEE ON STANDARD SOILS—Albert H. Rant, Secretary of this committee, reported in the absence of Emil A. Vitalis, Chairman. He stated that the committee is still concerned with the lack of consistent readings of the apparatus used by the cooperating laboratories. To correct this the machines are being calibrated to standards in order to eliminate the present wide variations among them. The goal is to get 95 per cent accuracy on repeated runs based on statistical studies. The standard soil fabrics at present available appear to hold promise for successful use in testing as soon as the instruments are calibrated.

REPORT OF COMMITTEE ON FIRE RESISTANCE—Dr. Stiegler, in the absence of J. Redmond, Chairman, read the report. Cooperation is continuing with Sub-Committee B-1 of Committee D-13 of A.S.T.M. There has been such a high degree of agreement between the A.A.T.C.C. and A.S.T.M. groups that it is reasonable to expect that the final test procedures will be identical in every detail. Our group is continuing its study of the influence of the fabric sample holders.

REPORT OF COMMITTEE ON VOCATIONAL TRAINING—P. J. Wood reported for this committee. After some consideration this committee has concluded that their first approach should be to prepare a manual on the foundamentals of mathematics and physics to be made available to those in our industry who have not had these subjects in formal training, but through this means may be prepared for later manuals covering such subjects as chemistry, dyeing, bleaching, scouring and finishing. Similar manuals in other fields have proved to be very useful and very popular. The committee recommends that these manuals be prepared as a vacation project by some one from the academic field and seeks an appropriation of funds to cover this activity. Inasmuch as the manuals would be sold it is expected that there would be no out-of-pocket cost eventually to the Association.

REPORT OF COMMITTEE ON CONTINUOUS WOOL SCOURING—E. A. Leonard, Chairman, reported that his committee had met and organized. They recognize the difficulty of studying continuous scouring in mill tests. It was concluded that a laboratory test method is desirable. They have reviewed the literature and developed a method, together with apparatus and procedure. The criterion is to be the residual grease in the wool after scouring. They have also arranged to include in the procedure a rapid method of grease extraction for testing purposes. Raw grease wool carefully blended will be carded and spun into yarn and it is proposed that the A.A.T.C.C. will eventually maintain a stock of this reference raw wool to be sold to those interested in having it. The committee will circulate these data to the members preparatory to further action at a later date.

REPORT OF COMMITTEE ON WATER RESISTANCE—G. A. Slowinske, Chairman, reported that his committee had a very profitable meeting. The following conclusions were arrived at:

1. The committee will change to a blotter 6 x 6 inches for the immersion absorption test. This is the same size blotter that is being used in the raintester.
2. The committee will prepare a section for the *Year Book* which will recognize other tests for water resistance which have not been formally studied by the committee but which they think are good in principle.
3. The matter of definitions will be further studied. They recognize that it is desirable to have official definitions of
   a. Water resistance
   b. Water repellency

   Suggested definitions will be circulated to the full committee after which recommendations will be made.
4. It also appears desirable that the scope of the various tests be defined. It is recognized that the several tests measure only certain factors. The entire membership of the committee will be polled with the expectation of recommending formal definitions of the scope of each of the tests.

The committee has carefully considered the results of the Lowell study on nozzles for the raintester and concludes that while there may be slight differences in the water delivery both the Mico and ITT nozzles give the same penetration effects on fabrics. The committee is of the opinion that the present nozzle is properly defined by the present Mico drawings and that the ITT nozzle, while satisfactory, is not necessary and it is of course more expensive to make and to standardize.

The committee has also studied the question of how long the nozzle will perform satisfactorily. These tests have run three months, and show at the end of that time, by comparison with a new nozzle, that the agreement is very good. The

committee will approach Mico for a quotation on a modified nozzle with removable front plate for easier cleaning and inspection.

REPORT OF COMMITTEE ON FASTNESS TO LIGHT—Matthew J. Babey, Secretary of this committee, reported in the absence of C. A. Seibert, Chairman. Reference was made to the recent comparisons of American versus British, versus Swiss standards for testing and grading fastness to light. Dr. Draves has corresponded with Dr. Rabe of the German Fastness Commission and also with the Swiss Commission. He reports that they do not seem very impressed with our ideas and that further correspondence will be involved. The present means of calibrating Fade-Ometers are generally recognized as being a great improvement over the situation as it existed before they were announced, but they are still not 100 per cent satisfactory. Mr. Seibert, who is working as a Research Associate, is making a thorough study of other ideas which should make possible the preparation of better calibrating papers and it is hoped that at the General Meeting a report of his work will be available.

REPORT OF COMMITTEE ON SNAG RESISTANCE—Dr. J. E. Smith, Chairman, reported that the sandpaper test has been approved by Sub-Committee A-12 of Committee D-13 of A.S.T.M. The committee is concerned with the comparison of the sandpaper test with the methods proposed by the National Association of Hosiery Manufacturers and by the U. S. Testing Company. As previously reported they recognize as important factors

1. The ease with which the snagging surface engages the loops of the hosiery.
2. The resistance of the loops to distortion when they are so engaged.

Dr. Smith exhibited a very simple instrument which, it is believed, measures the force necessary to distort the threads once they have been snagged. This instrument consists of a needle with a hook which is attached to a strip of spring steel to which is also attached a strip of plastic containing a scale. From this assembly is suspended a string at the bottom of which is a weight which may be taken from the ordinary set of weights used in connection with balances. The hook is snagged onto a single thread and the force or weight which will produce a 12 millimeter loop snag is determined. Forces from 7 to 50 grams have been determined for different stockings. When the force required is plotted logarithmically against the logarithm of the length of pull a straight line graph results. In its present development this method is not considered highly refined but further studies are being made. These needle assemblies will be provided for each member of the Committee and they will experiment with the device by the procedure tentatively given, together with modifications. It is expected that the data which results will help explain why the three present methods for evaluating snag resistance often give different results.

REPORT OF COMMITTEE ON FASTNESS TO WASHING—C. A. Sylvester, Chairman, reported that the committee will be ready to present a tentative test in the very near future and that they are satisfied with the proposed method. Not only does one test give results comparable with five commercial launderings, but two tests agree with ten commercial launderings. His committee has given consideration to the possibility of establishing one set of wash tests which will be suitable for all fibers. They are starting with tests No. 1, 2, 3, and 4 for cotton and hope to extend their use to the other fibers. It is recognized that one more test is needed to predict the results of hand washing and they expect to be able to set up a mechanical test to cover this, probably by work through the Wool Committee. The committee has also considered the advisability of replacing the acetic acid sour in our present wash test by the use of silico fluoride as is used in laundries. It is indicated that the present acetic acid wash is preferable and that the substitution will not be recommended. They have also given consideration to the suggestion that the acid rinse following the No. 1 wash test be eliminated because some dyes cannot stand the acid. After much study they have found that the presence of the acid gives a better controlled test and that most dyes do withstand the treatment, and, therefore, it seems preferable to continue with the acid rinse. Mr. Sylvester also stated that customer survey data are being developed by Dr. Dorothy Houghton and that the committee is at present attempting to interpret the data so far developed.

Charles Schmitt commented from his recent experience on the fact that the present wool wash test is not adequate and the committee will give consideration to his comments.

REPORT OF COMMITTEE ON WOOL SHRINKAGE—J. E. Goodavage reported that his committee on the shrinkage of socks has been working for three years, and has pretty much completed its investigation. He recognized the value of cooperative work done with the National Association of Hosiery Manufacturers, who had a committee with the same objectives, and our committee has worked with that committee for two years. N.A.H.M. made 1,000 pairs of carefully knitted socks available for this work. These socks were distributed to five companies who recommended shrinkproofing treatments for wool socks, and they applied their treatments. These hose were coded by N.A.H.M. and then subjected to commercial and automatic launderings. They were also tested by the Army Accelerated Hosiery Test and the Field Mobile Laundry Test. A great deal of data were collected, summarized and statistically analyzed. This committee is now ready to present a tentative 24" washwheel test and will determine by further work the tolerance which will be permitted in the test. He pointed out the desirability of developing a smaller machine than the 24" washwheel. Mr. Goodavage also referred to a new measuring device for hosiery which he termed the Scholler instrument which measures felting and shrinkage. It is a modification of the Schieffer instrument. The Scholler instrument is easily procured and costs only a few dollars as compared with $150 for the Schieffer. The work so far shows that the socks can be rendered shrinkproof to withstand 20 commercial or home launderings. The Army tests are too severe and these do not compare with the home launderings. Three thousand measurements were made and N.A.H.M. paid for much of this testing. The data show interesting information on the comparison of synthetic detergents against soap in these repeated launderings and bring out factors in connection with the load to liquid ratio. In connection with the desire for a smaller piece of equipment the committee has developed data on the use of an apartment type washer on which the results look interesting. Tests must be carefully run as their work indicates that it is possible to get extension instead of shrinkage in some treatments. A report of all this activity will be prepared by Mr. Goodavage and circulated to the members of this committee within the next two months. Mr. Goodavage also stated that some of the special socks are still available if they are of interest to anybody who could contribute further to this work. There was general discussion of this subject by Dr. Coughlin, C. W. Dorn and Dr. Stiegler.

Charles Schmitt presented a question on the perspirometer. He felt that there had not been sufficient publicity on the availability of this instrument and that there also may be some question of the price charged, particularly for the extra packs.

The meeting adjourned at 4:10 p.m.

Those present were:

J. R. Bonnar, *Chairman*

H. W. Stiegler, *Research Director*

G. H. Schuler, *Secretary*

E. J. Allard	L. S. Little
W. D. Appel	A. R. Macormac
E. C. Atwell	J. E. Meili
M. J. Babey	W. R. Moorhouse
W. H. Cady	J. E. Norton
H. C. Chapin	A. D. Nute
H. M. Chase	A. H. Rant
W. E. Coughlin	R. E. Rupp
F. Dannerth	C. H. A. Schmitt
C. W. Dorn	G. A. Slowinske
C. Z. Draves	J. E. Smith
W. C. Durfee	E. I. Stearns
K. C. Everett	J. A. Stevenson
J. E. Goodavage	C. A. Sylvester
J. M. Gould	H. H. Taylor
H. E. Hager	P. Theel
A. E. Hirst	F. Tripp
W. A. Holst	W. Von Bergen
J. H. Jones	J. F. Warner
A. J. Kellner	H. E. Wilde
D. P. Knowland	P. J. Wood
E. A. Leonard	J. A. Woodruff

GEO. H. SCHULER, *Secretary*

—♦ ♦—

Joint Meeting with CATCC

MEMBERS of the National Council and General Research Committee are set for the joint meeting with the Canadian Association of Textile Colourists and Chemists at the Mt. Royal Hotel in Montreal, Que., on June 9-10.

The Council and Research Committee meetings will be held on Friday morning (the 9th), somewhat streamlined to condense the work into four hours. Interested Canadians have been invited to sit in as guests. Friday afternoon will be devoted to two technical papers, one by Dr. Milton Harris on "Fibers", and the other by Dr. Alfred C. Goodings, Director of the Ontario Research Foundation, on some phase of wool processing. Friday night will be a gala event featuring some outstanding Canadian as guest speaker.

Saturday morning will be given over to an open forum on Wool, Cotton and Synthetic Fibers. Questions have been sent in on the particularly vexing problems connected with these subjects and a joint Board of Experts representing both American and Canadian chemists will try to answer them. J. Robert Bonnar will act as Chairman.

Saturday afternoon and Sunday have been left open for golf, sightseeing, etc.

—♦ ♦—

Report of Western New England Section Meeting

A MEETING of the Western New England Section was held on April 14th at Rapp's Restaurant, Shelton, Connecticut. A dinner preceded the meeting.

The speaker for the evening was Raymond W. Jacoby, Director of Research, The Ciba Company, who discussed various aspects of textile processing. He particularly stressed the necessity of an open-minded attitude on the part of both management and technical people in the field of textile finishing. Mr. Jacoby pointed up his remarks with comments on some of the more recent developments in dyeing and finishing.

Prior to his main talk, Mr. Jacoby discussed the coming annual convention at Portsmouth and extended an invitation on behalf of the Rhode Island Section.

Respectfully submitted,

A. S. NYQUIST, *Secretary.*

MAKE YOUR PLANS NOW

TO ATTEND THE

29th Convention

A. A. T. C. C.

Wentworth-by-the-Sea

Portsmouth, N. H.

SEPTEMBER 28, 29, 30

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RHODE ISLAND SECTION

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

50-13

Education: To receive B.S. in Textiles from Bradford Durfee Technical Institute in June, 1950.

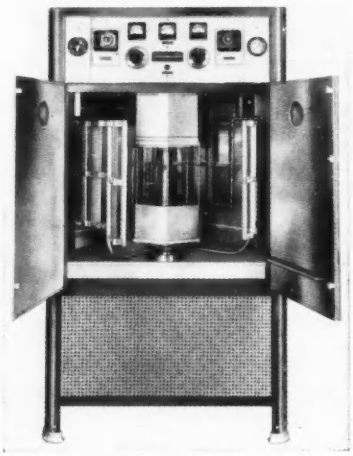
Experience: Four summers in dyeing and finishing plants.

Age 26; veteran; married; references; New England or Mid-west preferred.

5-29, 6-12

Outing Committee of the Northern New England Section. Photo taken at the March Meeting held at Massachusetts Institute of Technology.

TRADE NOTES • NEW PRODUCTS



Type XW Weather-Ometer

• New Weather-Ometer Added to Atlas Line

A new Weather-Ometer, called the Type XW has recently been announced by the Atlas Electric Devices Company, 361 W. Superior Street, Chicago. According to Atlas, the Type XW is a completely redesigned and modernized version of the Model X-1-A into which has been incorporated many new features employed for the first time in any weathering machine as well as many features of the company's Twin Arc Weather-Ometer for automatic control of test conditions.

The source of radiation in the Type XW is a Sunshine Carbon Arc of the open-flame, motor driven type whose radiation at the specimens very closely approximates natural sunlight both as to intensity and spectral distribution. The arc, accomodating three pairs of carbon electrodes, automatically shifts from one pair to another as the carbons are consumed, thus providing for a continuous burning time of 16 to 18 hours per trim of carbons. The Corex D filter panes are mounted in a new, more convenient type holder designed to eliminate the possibility of unfiltered radiation reaching the specimens. The lamp is mounted in a fixed position and is rotated through 180°, providing access to all parts of the lamp for retrimming and servicing and thus eliminating all overhead arches, cables, pulleys and counter-weights. After trimming, the arc is said to operate continuously without attention until the carbons are consumed, at which time a limit switch automatcially shuts down the entire machine.

Specimen temperatures, over a wide range, are reported to be automatically maintained throughout the test at the value selected by the operator. This is accomplished by rotating the specimens around the constant light source at a fixed distance, and by uniformly removing excess heat from all specimens by assuring a constant volume of air at a constant temperature. The constant volume of air is provided by a blower unit which is in continuous operation. Constant temperature of air is maintained by a system of ducts and an air mixing valve at the point where air enters the insulated chamber. The air mixing valve is driven by a modulating motor actuated by the thermostat; this arrangement automatically proportions and mixes the proper amounts of warm air from the test chamber and cooler air from the room thus eliminating variations due to room temperature.

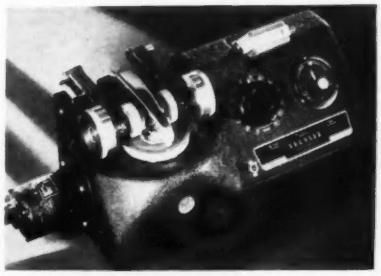
The conveniently located control panel of the Type XW contains all control and indicating instruments, including an ammeter and voltmeter, voltage adjusting switch, voltmeter switch and arc current regulating mechanism. The actual number of hours of arc operation are indicated on a running time meter, while a cycle meter automatically controls the interval and duration of the periods of light only, light with spray and spray only. A time switch enables the operator to set the machine for automatic shut-down for any predetermined time between 1 to 24 hours.

The capacity of the Type XW is 54 specimens—each measuring 3 by 9 inches. According to Atlas, the Type XW will meet all specifications calling for the Model X-1-A weathering unit.

• IRI Meets at Westchester C. C.

The Industrial Research Institute, Inc. held its thirteenth annual meeting April 26-28 at the Westchester Country Club, Rye, New York.

Dr. C. F. Rassweiler ,Vice President for Research and Development, Johns-Manville Corporation, New York, was elected President for the ensuing year and Dr. Harry N. Stephens, Director of Research, Minnesota Mining and Manufacturing Company, St. Paul, was elected Vice President. C. G. Worthington continues as full time Secretary-Treasurer. Dr. Allen Abrams, Vice President, Marathon Corporation, Rothschild, Wisconsin, and James A. Stewart, Vice President in Charge of Research and Development, American Can Company, New York, were elected to serve three-year terms on the Board of Directors.



Model 140 Taber Abraser

• New Taber Abraser

The new Taber Abraser, a product of the Taber Instrument Corp., 111-TCC Goundry St., N. Tonawanda, N. Y., incorporates the Taber rotary rub-wear action of dual abrading wheels crisscrossing their abrasion path. The right wheel rubs the specimen from the center outward and the left wheel rubs the specimen from the outside in toward the center so the abrasion lines cross each other like the letter "x". The action is continuous throughout the 360° rotation of the specimen and closely parallels abrasive wear encountered in actual use, such as wearing a garment, handling and cleaning painted surfaces, walking on floor coverings, and like sources of abrasive wear.

The new Taber Abraser features sturdier shafts and larger ball bearings, a capacitor type motor with heavy duty worm-gear drive, extra powerful vacuum unit with dual suction nozzle for high efficiency pickup of abradings, and electric counter for registering the wear cycles. The two sets of stainless steel weights, in addition to the weight of the arm, provide three standard ranges of wheel pressure against the specimen, namely 250, 500 and 1,000 grams. Provisions have been made for counter-balancing the weight of the abrading wheels when using the 250 grams load.

A variety of holders for different kinds of specimens have been developed and resilient type Calibrase wheels used to abrade both hard and soft materials are supplied in five types to be selected according to requirements.

Quantitative or total wear of a specimen surface is indicated by the counter reading from the start of the test to the first sign of penetration, like a spot worn off a paint coating or a hole appearing in a fabric. Both methods give a numerical result which is directly comparable for different samples. Where a decorative pattern is embossed or applied underneath a protective coating the test is usually run to the end point where the appearance becomes objectionable.

• Textile Machinery Show Draws Over 20,000

More than 20,000 visitors from the United States and 35 foreign countries attended the 1950 American Textile Machinery Exhibit staged recently at the Atlantic City, N. J., Auditorium according to J. Hugh Bolton, President of the National Association of Textile Machinery Manufacturers which sponsored the show. Over 240 exhibitors displayed and demonstrated their products and new developments.

A heavy concentration of mill operators from the South was noted and the largest contingents of foreign visitors came from Canada, France, Germany, The Netherlands, Mexico, Switzerland, England and the Central and South American countries. Other countries represented included Australia, Austria, China, Finland, Israel, Italy, Sweden, Turkey, Denmark, Belgium, Japan, Norway, Egypt, Syria, Greece, Pakistan and India.

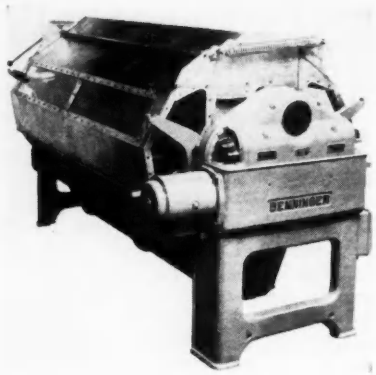
In addition, large groups of students from the leading textile colleges attended. An extensive cross-section of textile industry personnel were on hand all the way from top management down. Mr. Bolton attributed the huge attendance to the excellent location and facilities of Atlantic City.

"Cost cutting and labor savings were emphasized in the $5,000,000 exhibition of machinery, the first show the National Association of Textile Machinery Manufacturers has staged in more than a decade," said Erwin N. Darrin, Chairman of the Exhibition and Vice President of the Draper Corp. "General opinion was that the textile industry is headed toward widespread use of new machinery which eliminates entire manufacturing processes, modernized mechanisms with fewer parts and much greater efficiency, and mechanical and electronic controls and safety devices." (The trend also seemed to be toward modernizing those processes that will not be eliminated, to reduce to a minimum the handling of fiber, yarn and fabric.)

W. F. Lowell, Vice President of the Saco- Lowell Shops probably summed up the views of a majority. He stated that "the exhibition has proven to be, both from the point of sales and interest, far beyond expectations."

• Dr. Partridge Named Director

Dr. Everett P. Partridge, director of research of Hall Laboratories, Inc., and Calgon, Inc., since 1935 has been named director of Hall Laboratories, Inc., according to an announcement by D. J. Erikson, president of Hagan Corporation, parent company of Hall and Calgon.



Benninger Dye Jig

• Butterworth Represents Benninger Line in U. S.

H. W. Butterworth & Sons Company, Philadelphia, has recently been made exclusive American representative of Benninger Engineering Co., Ltd., Uzwil, Switzerland. The Benninger line of finishing machinery includes open-width bleaching, dyeing and boil-off machines, chainless piece-goods mercerizing machines, dye becks, impregnating machines, extractors, squeezing mangles, washers and hank yarn dyeing machines.

The Benninger Dye Jig, which Butterworth executives believe will find widest acceptance in the American market, was first shown in America at the Butterworth exhibit at the American Textile Machinery Exhibition in Atlantic City, May 8-12. Benninger, recognized by many as the largest manufacturer of automatic jigs in the world, is known for their exact matching of shades.

An outstanding feature of the Benninger Dye Jig is the automatic reversing and stopping device with self-acting passage counter. With automatic reversal, dye house production is increased, it is stated. Labor costs are reduced because one man can operate up to six machines, depending on the type of cloth and the dyeing process employed. The compact, streamlined construction makes it possible to fit the machine into existing dyerooms.

Protection for delicate fabrics during the dyeing process is provided by an oscillating balance expanding device. With this device the contact between the rolls and the cloth is frictionless, insuring a creaseless run on any kind of cloth, the company states.

Although the Jig is available in either open or closed construction, only the closed type was shown in Atlantic City. The stainless steel hood reportedly reduces steam consumption, prevents oxidation of the cloth selvage and eliminates fogging of the dyehouse. The enclosure is easily removable for feeding and unloading.

Another feature of the Benninger Dye Jig is an oscillating squeezing device, which can be used to intensify the chemical reaction after processing, it is stated. This device also can be used to shorten the time normally required for desizing, soaping, rinsing, boiling-off or dyeing. The adjustable spring pressure can be applied to either of the rolls.

The drive is by built-in electric motor. Both polls are driven simultaneously, thus maintaining slight but constant longitudinal cloth tension. The cloth running speed is practically constant. Line-shaft drive can be furnished to meet special requirements.

The Benninger Dye Jig is made in the following standard widths: 51¼", 63" and 75", however it can be made in any desired width and engineered to meet specific mill requirements, and can be used on cotton, silk or synthetic fibers, staples or mixed fabrics. The Butterworth organization will maintain a complete stock of spare parts.

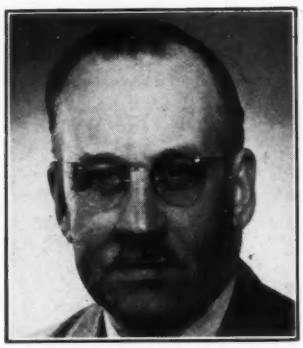
• Russell L. Brown Scholarship

The Russell L. Brown scholarship, in memory of Professor Brown, late head of the Wool Yarn Manufacture Department at the Lowell Textile Institute, has been presented to the school by the Davis and Furber Company of North Andover.

In making the scholarship presentation, Harold T. Godfrey, official of Davis and Furber, indicated that it would provide $300.00 to an applicant selected for general scholarship, initiative, character and need. Preference will be given to employees and the sons or grandsons of employees of the donor company. Should there be no suitable applicant in this classification, the scholarship shall be awarded for that year to a resident of Massachusetts selected by the scholarship committee. A Davis and Furber connected scholarship student may maintain the scholarship from year to year by meeting character and scholastic requirements.

• Chemical Consultation Division Organized

Establishment of a chemical research and consultation division under the directorship of Milton Feier, has been announced by the Panray Corp., New York, N. Y. The new division will specialize in helping manufacturers solve production problems, and, at the same time, develop new "ammunition" for their sales departments. Ample facilities for microanalysis, chemical therapeutics, chlorination processes, custom organic syntheses, pilot plant studies, and sponsored industrial research have been provided.



George O. Linberg

• Linberg Elected Belle Chemical V-P

The Belle Chemical Co., Inc. Reading, Pa., manufacturers of dyestuffs, announces that George O. Linberg, formerly Sales Manager and Assistant to the Director of the Textile Chemical Department of Monsanto Chemical Company, Everett, Massachusetts, has been elected a Vice-President and Director of the Corporation.

Mr. Linberg is Vice-President of the American Association of Textile Chemists and Colorists, Vice-President of the Dry Salters' Club of New England and is New England Councillor of the American Society for Testing Materials. He also is a member of the American Association of Textile Technologists, The Chemists' Club of New York, and the Southern New England Textile Club.

Mr. Linberg will make his headquarters in Boston, Massachusetts and will direct sales of the corporation.

• New Flame-Retarder

A new flame-retardant compound, which is said to afford unique advantages in its applications to clothing fabrics and other textiles, has been developed in the laboratories of The Glenn L. Martin Company as a by-product of its over-all program of aeronautical research, C. C. Pearson, president, has announced.

This protective resin, designated as "HPM", has been licensed to E. I. du Pont de Nemours & Company for further research work in the hope of manufacturing it commercially as a complement to "Erifon", it is reported.

The new compound was a result of Martin engineering research work in connection with development of flame-resistant curtains and draperies for the Martin 2-0-2 airliner. Compounds available at the time would not satisfactorily withstand laundering or dry-cleaning. Consequently, the first demand met by HPM was that of providing durability in normal use.

The fabric is said to have good "hand" and treatment with this agent reportedly does not add noticeably to the fabric's weight.

Experimental quantities of HPM are reported to have been tested by the Textile Finishes Laboratory of the Army's Research and Development Depot at Philadelphia. Preliminary tests indicate that the compound is especially well adapted to meet the Army's flame-resistance requirements for clothing, it is stated.

• WRP Advisory Committee Discusses Progress

Forty members and guests of the Advisory Committee of the internationally sponsored Wool Research Project met May 3, 1950, at the Laboratories of Textile Research Institute in Princeton, New Jersey, to discuss the progress of the research on foreign and domestic wools and the results of the mill trials on these wools conducted by the Forstmann Woolen Company.

The Advisory Committee heard a report by Dr. James H. Wakelin on recent research results obtained in Princeton on both single fibers and on top roving and yarn in the study of the differences between foreign and domestic wools in connection with the effect of aging or resting of wool during industrial processing.

Dr. Wakelin announced a method of determining effective fiber diameters through the use of a vibroscope. The instrument which can be constructed and used with little difficulty in the Laboratory provides a rapid means of acquiring data without the laborious use of a microbalance. He also announced the successful use of the IBM punched-card system in analyzing and storing research data for future use. It was felt that this development would be of particular interest to textile firms already in possession of punched-card accounting machinery but who have not considered its use as a research tool.

Werner von Bergen of the Forstmann Woolen Company reported to the Committee on the results of scouring studies on the foreign and domestic wools and the recent processing of the Australian wool into cloth. In this processing study, the wool was rested for a predetermined period both in the roving and in the yarn in order to compare the characteristics of the cloth made from these rested wools with the cloth which had been woven from wool with no resting or aging period in its processing. The Australian fine wool is the first of four lots which are to be processed at the Forstmann Company in order that a comparison may be made between medium and domestic wools with the same types of wool obtained from New Zealand and Australia.

Dr. Harold P. Lundgren of the Western Regional Research Laboratory of the Department of Agriculture at Albany, California, described the results of some recent studies conducted by that Department on a new alcohol process for wool scouring. This process appears to have considerable promise of commercial application to the large batch scouring of wool.

• Surface Active Agents Become "Surfactants"

A new word, Surfactants, has been coined by Antara Products, General Aniline & Film Corporation, and has been presented to the chemical industry to cover all materials that have surface activity, including wetting agents, dispersants, emulsifiers, detergents and foaming agents. This new term is not copyrighted or trade marked. It gives a distinctive name to one of the fastest-growing branches of the chemical industry, with an annual production now of over 800 million pounds.

Surfactants are the unique chemicals which concentrate in liquid surfaces and interfaces. They lower surface tension and tend to increase the surface area. Some act as wetting agents by spreading quickly over solid surfaces and into pores. Others cut into deposits of grease or solid particles and disperse them to facilitate cleaning. Dispersants also keep fine powders suspended in lotions and liquids. Other surfactants emulsify oils with water, others generate lavish foams and suds and still others suppress the suds in washing compounds.

Synthetic detergents may possess many of these properties, but true detergents account for only about 150 of the 750 brand-name surfactants now on the market. For lack of a general name, wetting agents and emulsifiers have been called detergents. The new word, surfactants, aims at ending this confusion. The word, detergent, returns to its original meaning, a cleansing agent.

• Crotonaldehyde Data Sheet

Crotonaldehyde is discussed in a new technical data sheet published by Tennessee Eastman Corporation, Kingsport, Tenn. The bulletin contains specifications and properties of this unsaturated aldehyde, plus a number of proposed uses. The proposals mention crotonaldehyde as a specialty solvent and as an intermediate in the preparation of synthetic resins, vulcanization accelerators, dyes and synthetic pyrethrins.

• TRI Absorbs Textile Foundation

The absorption of the personnel and assets of the Textile Foundation by the Textile Research Institute has begun with the appropriation of $275,000 to TRI by the former organization. The move had been expected for quite some time, and up to this point TRI had been aided by financial and moral support as well as technical and administrative guidance for some time. The Foundation came into existence in 1931 for the purpose of spending on research the capital gained from seizure of German patents in the first World War.

The financial resources of the Foundation within the past months had been sufficient to provide for only two or three additional years of operations and with formal action taken in April at Washington at the annual meeting of directors the machinery was created to terminate the Foundation's activities.

Members of the board are Franklin W. Hobbs, William Whitman & Sons Co., Boston; Frank Cheney, treasurer of Cheney Bros. and the Secretaries of Agriculture and Commerce.

At a luncheon ceremony at the Hotel Commodore on May 3, Mr. Hobbs, Chairman of the Textile Foundation, formalized the action, which was acknowledged by A. G. Ashcroft, President of the Institute.

In concluding the discussion of the luncheon session, Dr. John H. Dillon, who has been Director of Research of both the Institute and the Foundation, pointed out that the Institute was fortunate in being able to retain the scientific advisors of the Foundation for guidance in the future. He further stated that there would be no discontinuity in the program which has been the joint effort of the two organizations since the staff, formerly employed by the Foundation, will automatically become a part of the Institute staff, working on a research scheme which will continue in a pattern of carefully planned fundamental textile research. Dr. Dillon emphasized that the appropriation of funds by the Foundation to the Institute will result in a gradual expansion of the total research effort in the Princeton laboratories where the Foundation and Institute have previously conducted their separate but coordinated programs. Initially, he said, the funds will be expended at approximately the same rate as in the past, upon the following broad research projects jointly agreed upon by the two organizations:

a. Physical-chemical properties of single textile fibers as they relate to processing characteristics—carding, spinning, weaving, finishing and dyeing;

b. Service characteristics of fabrics as functions of yarn and fiber characteristics;

c. Increased utilization of natural fibers such as cotton and wool through better knowledge of their constitution and properties;

d. Improvements in fabrics by increased knowledge of natural and synthetic fibers;

e. Improved techniques for testing fibers, yarns, rovings and fabrics; and

f. Evaluation of the physiological-psychological chemical-physical complex constituting the "comfort qualities" of clothing.

The Foundation Advisory Committee will serve the Institute. Members of this body are: Dr. Karl T. Compton, Chairman of the Corporation Massachusetts Institute of Technology and Chairman of the Foundation's General Advisory Committee: Dr. Vannevar Bush, President, Carnegie Institution of Washington; Dr. Lyman J. Briggs, formerly Director, National Bureau of Standards; Dr. Robert E. Doherty, President of Carnegie Institute of Technology; Dr. Hugh S. Taylor, Dean, Graduate School, Princeton University; Dr. Warren E. Emley, formerly Chief of Organic and Fibrous Division of National Bureau of Standards and now a chemistry professor at Rutgers; W. D. Appel, Chief, Textile Section, National Bureau of Standards; Dr. A. G. Ashcroft, Director of Research, Alexander Smith & Sons Carpet Co.; Dr. Donald H. Powers, Director of Research, Wm. R. Warner Co.; and Dr. R. Y. Winters, Assistant Director, Agriculture Research Administration, U. S. Department of Agriculture.

• P. T. I. Chemistry Department Adds New Member

Director Bertrand W. Hayward has announced that John E. Cline has joined the staff of the Chemistry Department of P. T. I. Mr. Cline, a graduate of Vineland, N. J. High School and Drexel Institute of Technology, will devote most of his time to teaching organic chemistry.

Mr. Cline was a Laboratory Assistant at Drexel for six years and was employed by Rohm & Haas Co., Supplee Dairy Co., and Corson Lime Co., as chemical analyst.

• DuPont Personnel Changes

E. I. duPont de Nemours & Company, Inc., has announced changes in the dyestuffs sales division of the Organic Chemicals Department.

C. B. Harris, who formerly was manager of the textile section, has been made manager of the contracts-miscellaneous section. He is succeeded by G. M. Markle, former manager of the lakes, paper and leather section. Dr. K. C. Johnson, former assistant technical manager of the dyestuffs division has taken Mr. Markle's place.

Albert Malick

• Rexo Merges With Emkay

Albert Malick has joined the Emkay Chemical Co., Elizabeth, N. J. and has been elected vice president. His own business, Rexo, Inc., has been merged with the Emkay Chemical Co., which will manufacture and sell Rexo products, retaining brand names and trademarks. Rexo personnel have become part of the Emkay organization.

Mr. Malick is a member of the American Association of Textile Chemists and Colorists, the American Association of Textile Technologists, the American Chemical Society, the Textile Square Club of New York, and is secretary of the New Bedford Textile Institute Club of New York. Before starting Rexo, Inc., he was chemist, salesman, and technician with Colloids, Inc. for fifteen years.

Emkay Chemical Company was established in 1944 by Frank Kivian, formerly vice president of Hart Products Corp. and H. Martin Friedman. Mr. Kiviat retains the presidency in Emkay Chemical Co., and Mr. Friedman remains as secretary and treasurer. The company manufactures chemical specialties for the textile, paper, and leather industries.

• Kaye Joins Alrose

Ralph E. Kaye, Jr., has joined the Alrose Chemical Company of Providence, R. I., as mid-west sales representative, with headquarters at the new Alrose-Chicago Office, 629 West Washington Street. Mr. Kaye was formerly associated with the Atlas Powder Company.

• U. S. Testing Moves N. Y. Offices

United States Testing Company, Inc. has announced the moving of its New York City offices to the McGraw-Hill Building, 330 West 42nd Street.

The new office will be managed by Thomas C. Ridgway of the Company's Service Division.

• General Dyestuff Corp. Literature

General Dyestuff Corporation, 435 Hudson Street, New York 14, N. Y. has released a booklet "Application of Vat Colors to Cotton Piece Goods Continuous Methods Using Williams Units" along with six new circulars. The sixteen page booklet (GS-55) includes charts and illustrations to supplement the text.

The circulars include:

G-642—Chromoxane Brilliant Violet SBA-CF.

G-643—Indanthrene Scarlet RA Paste. Indanthrene Scarlet RBA Paste.

G-644—Chrome Yellow SSN.

G-645—Algosol Grey IBL-CF.

G-650—Brilliant Indo Blue 5G High Conc. CF.

G-194-1 Cyclopon A Extra.

Excerpts from the circulars follow:

"Chromoxane Brilliant Violet SBA-CF is a straight chrome dyestuff for wool characterized by unusual brightness among chrome colors. It gives brilliant bluish-violet shades of good tinctorial value with very good to excellent fastness to fulling and to washing. As a consequence of only good fastness to light, however, this chrome dyestuff can be recommended for solid self colors only in heavy shades where brightness and fastness to washing are more important than fastness to light. By the use of the product it is possible to dye bright violet shades on yarn for effects in piece goods, which have a fastness to fulling and to crossdyeing unattainable with acid dyestuffs. Such effects are also fast to carbonizing. The fastness to light is fully adequate for effect threads when the dyeings are in full shade. Chromoxane Brilliant Violet SBA-CF has a particular usefulness not possible with other chrome or acid dyestuffs of giving bright violet shades on nylon yarn that can be effectively resisted and top-chromed simultaneously. When piece goods containing the dyed and resisted nylon yarns are subsequently dyed with many acid, chrome or Palatine Fast dyestuffs, this violet retains its shades remarkably well.

"Indanthrene Scarlet RA Paste and RBA Paste are straight anthraquinone vat dyestuffs, which produce fairly bright scarlet shades with very good to excellent fastness properties. The working and dyeing properties, fastness properties, uses for which they are recommended and the shades given by these dyestuffs are sufficiently similar that they can be considered together. The RBA Paste brand is slightly bluer, brighter and stronger than Indanthrene Scarlet RA Paste and both are much yellower than Indanthrene Red FBBA Double Paste Fine. These two scarlets exhibit good to very good fastness to washing and to mercerizing, very good to excellent fastness to chlorine and very good to excellent fastness to light. The great resistance of full shades of these dyestuffs to light and to weathering make them especially useful for awnings. They are also recommended for draperies, tackle twills, play suits, dress goods, towels, and table cloths, or whenever good resistance to light and laundering are desired.

"Chrome Yellow SSN is a chrome dyestuff with good fastness properties, which can be applied to wool in any stage of manufacture by either the top-chrome or chrome-mordant method. It is suitable both for self shades and for economical brown combinations containing Anthracene Chromate Brown BBA Extra Conc., Alizarine Blue Black BA Extra and Diamond Red ECB Extra Conc. The most important use of the new product is for dyeing piece goods, such as suitings, containing silk-white or resisted-nylon effect threads. This chrome yellow permits the attainment of such effects where the wool must possess the good fastness properties of the chrome colors. For this purpose Chrome Yellow SSN may be used alone, but it is particularly suitable for use as an economical component in combination with other chrome dyestuffs with similar working and fastness properties.

"Algosol Grey IBL-CF is a straight dyestuff which is the water-soluble leuco ester of an indigoid vat dye. It is applicable to cotton, wool, silk and other fibers, by both dyeing and printing methods, whereby the vat dyestuff from which the leuco ester has been derived is regenerated inside the fiber. Comparatively simple and short methods, not involving alkali, permit the Algosols to be either printed or dyed on silk or wool with the attainment of excellent fastness properties but without impairment of hand or quality.

"Brilliant Indo Blue 5G High Conc. CF is a straight triphenylmethane acid dyestuff characterized by brilliant greenish-blue shades on wool and silk. These shades are similar to those obtained with Patent Blue AF Extra Conc. and in general may be used for the same purposes. In fastness to water, washing, fulling, perspiration and sea water, however, the product is superior to the Patent Blues. Since it dissolves readily and levels well in a weakly acid bath, it is suitable for machine dyeing. In resistance to chrome, Brilliant Indo Blue 5G High Conc. CF is equal to Patent Blue AF and can thus be used in place of the latter for shading chrome dyeings on loose wool or shoddy, or even on wool piece goods, provided the bath does not contain formic or sulfuric acid. Because of good fastness to washing and to sea water, the product is recommended for bright blues on knitting yarns where wet fastness and brightness are more important than fastness to light. Exceptional greenness and brightness make this brand very useful for bright green shades in combination with Milling Yellow H5GA-CF, a dyestuff with similar dyeing properties and similar but somewhat better fastness properties. As Brilliant Indo Blue is superior in fastness to fulling on loose material to Patent Blue AF Extra Conc., and at the same time possesses good fastness to carbonizing and decatizing, as well as better fastness to washing than the Patent Blue brand, it can be used in preference to the latter for dyeing slubbing. When only a medium fulling is necessary, it is also very suitable for loose wool and shoddy. A greenish blue of such brightness should prove of particular interest for use on blankets where it shows comparatively good resistance to stoving, either alone or in combination with Milling Yellow H5GA-CF.

"Cyclopon A Extra, a synthetic detergent in powder form, is recommended primarily as an efficient and economical scouring agent for raw wool. Cyclopon A Extra can also be used as an all-around detergent and dyeing assistant in the same manner as the older Igepon T, to which Cyclopon is chemically analogous, provided a temperature above 110°F. is maintained so as to bring out the maximum efficiency of the product. Advantageous properties of the product are listed as follows: chemically stable toward boiling dilute mineral acid and caustic alkali; chemically stable toward the development of rancidity if left in fabrics; chemically stable toward textile bleach solutions, such as bleaching powder, sodium hypochlorite and peroxide; stable in solution toward hard water and dilute mineral salts; excellent preventive against the formation of lime-soap curds and an excellent disperser for deposits of lime-soaps already on stock, yarns or fabrics; effective in either neutral or alkaline solution and readily rinsible from stock, yarns or fabrics."

• Hodges Introduces German Developments Here

Thomas Hodges III, who is now handling product distribution for Hodges Associates, 11 W. 42nd St., New York, N. Y., has returned from Europe with German items to be introduced to the American market. They include fibers, dyestuffs, auxiliaries and chemicals.

Among the dyestuffs are a new group of shoddy fast dyes in black, brown, blue, navy blue and gray. In a one hour operation, shoddy and waste wool are reported stripped and re-dyed in the same bath in one operation. A new range of vat browns and khaki colors is also reported.

Auxiliaries include the following:

Albigen A—a product reported to prevent all re-deposits of dyestuffs on fibers

in washing or boiling. It is also claimed a most powerful stripping agent.

Kaurit 140 Paste—for nonshrink and nonswelling finishes for all textile fibers, also for fixing water-soluble finishing agents on all textile fibers.

Solidogen FFL—a product for increasing the fastness of all substantive dyestuffs.

Nikrulan G—a new wool shrinkproofing process containing no chlorine, and said to be suitable for yarns, knit goods and piece goods, before or after dyeing in a 20 minute operation with the same bath liquid suitable for as many as five different lots.

Humectol C Concentrate—a new diversified wetting agent.

Immediate Printing Blue and Black Paste—reportedly speeds sulfur printing with improvement of fastness. This product, it is claimed, does not stain copper rollers.

Three fibers are outlined by Mr. Hodges. These include Perlon, Lanusa and Cuprama. Perlon is the German nylon and future announcements about it are forthcoming. Lanusa is a wool like fiber made on the viscose rayon system. It reportedly has the same physical and warmth characteristics as wool. It is supplied in 2.75, 3.75, 6 and 10 denier in dope dyed colors. Fastness is reported superior.

Cuprama is a cuprammonium staple fiber of wool characteristic in 18 spun dyed shades. These colors range from very bright colors to dull and are picked for their fastness properties. Fibers are from 2.75 up to 14 denier, and are said to have a complete range of colors in spun dyeing.

• "Soiled Wool" Fabric Available

Foster D. Snell, Inc. has announced the availability of "FDS Artificially Soiled Wool" fabric, after several years of research on the development of a soiled wool for the measurement and evaluation of detergents. This wool has been added to complement the "Standard PSC Soiled Cotton" fabric announced last spring and now being sold. The soiled cotton is prepared by a group at Pennsylvania State College under the direction of Dr. Pauline Beery Mack and is packaged and distributed by Snell.

Currently, Pennsylvania State College is reported to be completing the installation of new and larger soiling equipment to meet the increased demand created for soiled cotton fabric. While soiled cotton is used to evaluate heavy-duty detergents, the soiled wool is used for light duty detergents.

The unsoiled virgin wool is washed in a nonionic detergent diluted in water and rinsed three times in tap water at 110° F. It is then soiled by agitation in 10 gallons of water while a hand homogenized soil is added slowly.

The artificial soil used in the wool has been compounded to closely resemble the natural soil that is found in soiled woolen garments.

After soiling the cloth is washed, rinsed, and run through wringers twice to obtain an unwrinkled finish. It is dried overnight in a constant humidity room, with a protective covering to keep dust from bonding to the soil. On Hunter Reflectometer readings, it must agree with a reflectance of 14.5% with a tolerance of ± 2.5%.

A standard laboratory testing procedure for using the soiled wool in evaluating detergents is available from Foster D. Snell, Inc. on request.

Each package contains nine 4 X 12 inch swatches of wool. Individual packages cost $4.50 each. Discounts are allowed on purchases of multiple packages of the soiled fabric.

• New Dyeing Assistant Reduces Redyes of Nylon Hosiery

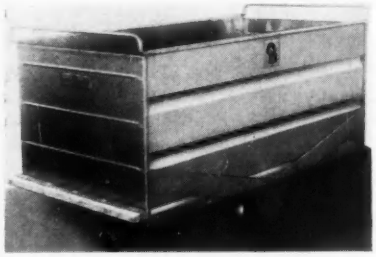
A new dyeing assistant developed by Amalgamated Chemical Corporation, Philadelphia, is reported to have cut down the percentage of redyes on women's nylon hosiery from an average of 12% to one-quarter of 1%. The assistant, called Evenate, is a nonionic condensate combined with a glyceride. It is available in an opaque thin paste which is reported to be readily soluble in water and to contain no sulfonates, amines or soaps.

Evenate was first introduced on a trial basis in August, 1948.

Among the advantages claimed for the resistant are: better penetration of dyes, better control of the dyebath, shorter dyeing time, better union between leg and welt, uniform shades from lot to lot, faster pairing due to extremely level dyeing, and uniform shades between leg and boot.

Evenate is said to also help in redyeing operations since it can be used to reduce shade when stockings are dyed too heavily and will not affect union or levelness adversely. It holds unions to shade, it is stated, and stripping is unnecessary.

Harold B. Dohner, President of Amalgamated, sees a wide application for Evenate, not only in women's hosiery, but also in nylon laces, underwear fabrics, knit goods, woven nylon, taffetas and sweaters. Mr. Dohner has found that Evenate works equally well with a selected group of acid colors as with acetate dyes.



Riggs & Lombard Cloth Truck

• S. S. Cloth Trucks

Stainless steel cloth trucks for general mill use are now being made by Riggs & Lombard, Inc., Lowell, Mass.

The trucks are made in various sizes, with the 36" x 72" x 28" deep proving most popular. Rigidized sides and ends are said to provide the needed strength with a minimum of weight. The solid type bottom is high in the center and slopes toward both sides. Drainage at the sides reportedly insures a minimum amount of moisture getting on to the wheels.

Rod type handles are at either end, as well as bottom rubber bumper strips for adequate collision protection. The undercarriage, which is entirely enclosed within the solid stainless steel bottom, is a galvanized iron framework. It is equipped with two large rubber tread wheels with roller bearing and stainless steel guards. Swivel-type end wheels have hard rubber treads and are equipped with ball bearings.

• New A.C.C. Department

American Cyanamid Company has announced the formation of the Dyes and Chemicals Export Department which will handle all foreign activities in connection with the products of the Company's Calco Chemical Division (except Pharmaceuticals), Industrial Chemicals Division, and Plastics and Resins Division. The combined department will be under the direction of Fraser M. Moffat, Jr.

H. E. Lorenz has been appointed Manager, and J. C. Martin, Assistant Manager, of the Eastern Hemisphere and all activities in that area. Henry W. Rojas has been appointed Manager, and W. T. Casey, Assistant Manager, for the Western Hemisphere and all activities in that area.

J. L. Clark, formerly Export Sales Manager of Calco Division, is assigned to special duties under Mr. Moffat.

Products handled by the new Department include dyes and pigments, intermediates, textile resins, rubber chemicals, plastic molding compounds and resins, heavy chemicals and industrial chemicals for the petroleum, paper, leather and other industries.

Alfred Brandt

• Brandt to Represent Warwick in Caribbean

Alfred Brandt has joined the sales staff of the Warwick Chemical Company, Division of the Sun Chemical Corporation, in the capacity of Technical Representative covering the Caribbean area including Central America, Mexico, Colombia and Venezuela, according to an announcement by Ernest Nathan, President. Mr. Brandt has traveled the above territory for many years in a technical and sales capacity.

• Lecture on Protective Coatings Industry

A paper, Physical Chemical Research in the Protective Coating Industry, presented by Dr. Roy H. Kienle, Director of Application Research, American Cyanamid Company, Calco Chemical Division, has been reprinted as Calco Technical Bulletin No. 901.

Dr. Kienle was selected to give the first of the Mattiello Lectures, established to honor Dr. Joseph J. Mattiello, scientist and teacher in the field of protective coatings, before the Federation of Paint and Varnish Production Clubs at Atlantic City, New Jersey, in November, 1949.

This study reviews the emergence of physical chemical research in protective coatings as an industrial science and its great influence on the remarkable growth of the organic coatings industry. The role of physical chemistry in the development of new solvents, vehicles, pigments, paint and actual film research, and some of the new contributions to be expected in the next few years are reviewed.

• Bulletin on Water Clarifiers and Softeners

A bulletin on Water Clarifiers and Cold Process Softeners is now available from Graver Water Conditioning Co., division of Graver Tank & Mfg. Co., Inc., which graphically describes the design, operation and features of the Graver unit of this type, known as the Reactivator, with explanations in tabular form. Introductory sections of the bulletin explain the principles and chemistry of cold process water treatment, and compare the Graver Reactivator with other methods of water purification. Various accessories are also described, and the bulletin is illustrated with diagrams and installation photographs.

Copies of this bulletin can be obtained by addressing Dept. 182, Graver Water Conditioning Co., 216 West 14th Street, New York 11, N. Y., and asking for Bulletin WC103.

• LTI Summer Tuition Revised

A revision in summer school tuition charges has been announced at Lowell Textile Institute. Under the new summer schedule, which begins on July 10, a minimum charge of $20 will be made for a course rated at only one credit hour, while fee for other courses will be set at $15 per credit hour. The maximum charge for any course will be $60, regardless of the number of credit hours it carries in excess of four.

The summer program will include first year courses in trigonometry, chemistry and physics at the high school level. Each subject will be presented as a college preparatory subject and will carry two credit hours.

A late addition to the subjects to be offered is a special course in home economics which will be taught during the latter part of the session. This four-week program will be given by instructors of the manufacturing departments under the direction of Prof. Vittoria Rosatto.

This course will cover textile fibers and fabrics and take the student through the various phases of textile manufacturing, with special attention to such matters as testing, laundering, dry cleaning and end uses of fabrics in general use.

The forthcoming session will be the first formal summer school to be conducted by the Institute. President Kenneth Fox explained that as the demand arises, summer courses will be expanded to cover the needs of prospective students.

President Fox also suggested that all students interested in summer courses contact the summer school director. Applications should be made as early as possible.

• Polyethylene Film Used As Drum Liner

Polyethylene's unique ability to remain unaffected by highly corrosive chemicals has led to its use as a drum liner for monochloroacetic acid, a product of the Hooker Electrochemical Company, Niagara Falls, N. Y.

Hooker's monochloroacetic acid is a white crystalline material packaged in a free-flowing flake form. It is used as an intermediate in the manufacture of carboxmethylcellulose, 2,4-dichlorophenoxyacetic acid, cyanoacetate, indigoid and thioindigoid dyes, ammonium thioglycolate, thioglycolic acid, glycine (aminoacetic acid) and other commercially important chemicals.

Use of the polyethylene film inner liner is said to provide a moisture and moisture-vapor resistant barrier which protects the acid against contamination in storage. The film's own chemical inertness reportedly prevents any interaction of the package and contents, while its chemical resistivity prevents contact between the fiber drum and the acid.

The protection thus afforded by the polyethylene film, which is supplied by the Plax Corporation, Hartford, Conn., simplifies handling and shipping and keeps the product in prime condition for use even after lengthy storage, it is reported.

• "Textile Dyehouse and Laboratory Supplies"

A beautifully bound catalogue covering their complete stock of dyehouse and laboratory supplies has been issued by Reading Scientific Company, 13th and Pike Sts., Philadelphia, Pa.

The pages are mounted on ring binders and can be easily removed or inserted for convenience. They contain photographs, descriptive material, specifications and prices for the entire line handled by Reading.

Included in the catalogue is a handy corrosion chart for acids, salts and miscellaneous items as well as a listing of textile books handled by the company.

• Hilton-Davis Expands Service in South

Hilton-Davis Chemical Company Division of Sterling Drug Inc. is expanding its service to southern dyestuffs customers through addition of a new technical representative to the staff of the Blackman-Uhler Company Inc., its exclusive southern agency, according to an announcement by Nelson S. Knaggs, vice-president in charge of sales. Charles Ratterree, the new representative, has had considerable laboratory and technical experience in the dyestuff field, Mr. Knaggs states. He is a graduate of The Citadel, Charleston, S. C., and served with the 5th Army in Italy during World War II.

Abstracts—

(Concluded from Page 356)

ture of wool, chemical attack may readily modify the cuticle and affect the penetration of dyes into the fiber. Among the more common practical treatments useful in the preparation of woolen materials are various forms of chlorination, bleaching with hydrogen peroxide, and stripping with hydrosulfite or zinc formaldehyde sulfoxylate. Wool treated by any of these processes exhibits increased rates of penetration by dyes due to the chemical degradation or modification of the cuticle.

(Note: is is impossible to do justice to this article in an abstract. Those interested should read the full text).—W.H.C.

Creasing and Creaseproofing of Textiles

D. D. Gagliardi and I. J. Gruntfest, Textile Research J. *20*, 180-8, March, 1950.

The ability of a fabric to resist creasing or wrinkling and to recover from bending deformations is determined by many factors, foremost among which are the stress-strain properties of its fibers, the geometric construction and arrangements of its yarns, and the presence or absence of finishing agents on or within the fibers. For cellulosic fabrics, with which this paper is mainly concerned, the exact interrelations among these various factors have not as yet been quantitatively determined. Nevertheless, considerable data have been presented in the literature dealing with some general principles related to the crease-resistance of textiles and to the industrial processes for producing crease-resistant rayon and cotton fabrics.

The authors endeaver to provide answers to the following questions:

1. Why do rayon and cotton fabrics crease when subjected to high bending strains?
2. What stress-strain properties of cellulosic fibers are related to the creasing phenomenon?
3. What fiber properties need to be modified in order to produce crease-resistant fabrics?
4. What chemical reactions and compounds are required to achieve this modification?
5. What are the relationships between the stress-strain properties of chemically modified fibers and various mechanical properties of a fabric?
6. What is the nature of the apparent tendering of some cellulosic fabrics resulting from creaseproofing treatment?
7. Finally, what are the requirements of an ideal creaseproofing agent for all cellulose fibers?

In conclusion, the authors state that the modification of cellulose by treatment with cross-linking reagents or resins which impart crease-resistant properties has greatly increased the range of usefulness of cotton and rayon fabrics, but much work still needs to be done in the design of special fabric constructions which are more ideally suited for crease-proofing treatments. There is also great room for improvement in the chemicals and processes for producing crease-resistance.—W.H.C.

French Synthetic Fiber Features Durability

Anon., Textile World *100*, No. 4, 120-1, April, 1950.

A pure unplasticized polyvinyl-chloride polymer fiber has been brought up to a commercial level in France for both industrial and domestic use. It has been developed in four forms (Rhovyl, Fibrovyl, Thermovyl, and Isovyl) by Societe Rhovyl, Trouville-en-Barrois, in the Department of Meuse.

Rhovyl is now available in the American market in a wide range of deniers. Production is now 200 tons per month.

The common and special qualities, properties, and suggested uses of these new fibers are tabulated. Some of the outstanding properties are non-flammability, mildew- and water-proofness, high tenacity, wet or dry, and resistance to light. They may be dyed with acetate dyestuffs.—W.H.C.

The Definition of Rayon. Viewpoint of the American Textile Industry

A. G. Scroggie, Textile Research J. *20*, 194-8, March, 1950.

The author gives a brief history of the events leading to the proposal in 1924 of the word "rayon" to replace "artificial silk" as a generic term for man-made yarns.

Rayon was originally defined in terms of cellulose-base products in the United States in 1926. This definition has been reaffirmed at regular intervals since that time, and has been endorsed by the U. S. Federal Tariff Commission, the U. S. Federal Trade Commission, and by government committees in Canada and in the Union of South Africa.

Producers on noncellulosic-base yarns in the United States do not consider their products to be rayon, and this is also understood by retailers and consumers. This is also true for nylon and glass products in the United Kingdom.

The proposal, originating in England in 1943, to redefine the word "rayon" as "A generic term for all fibers not of natural growth" is opposed by many interests in the textile industry in that country, including retailers and the producers of nylon, glass, and other non-cellulosic fibers. It is opposed also by many other countries, including the United States.

There is a definite need for the word "rayon" or a substitute term to cover the concept for which "rayon" has been used up to the present time, and redefining "rayon" in broader terms would require the establishment of another term to take its place.—W.H.C.

Degradation of Cellulose as Revealed Microscopically

C. W. Hock, Textile Research J. *20*, 141-51, March, 1950.

Because natural cellulose is fundamentally fibrous, degradation—be it caused by chemical agents such as acids and alkalies, by physical agents such as grinding and ultrasonic vibration, or by biological agents such as molds and bacteria—proceeds in a manner which reflects this basic fibrillate structure. The dimensions of the threadlike fibrils into which cellulose breaks down vary, depending upon the severity of the treatment and perhaps also on innate differences among celluloses from various sources. Following degradative action, light microscopy reveals fibrils of the order of several tenths of a micron in diameter. At the higher magnifications obtainable with the electron microscope, still finer fibrils, a few hundred Angstroms wide, are detectable. Certain degradative treatments cause a further transverse splitting of these fibrils into rod-shaped structures.

From x-ray and chemical investigations it is known that cellulose is made up of long-chain molecules whose arrangement with respect to one another gives rise to more or less ordered but poorly reactive crystalline regions and to disordered but easily reactive amorphous regions. Since microscopical studies show that many reactions proceed more easily in the regions between the fibrils than within the fibrils themselves, it appears that the crystalline cellulose is located principally in the fibrils, whereas the interfibrillar regions compose, in large measure, the amorphous fraction.—W.H.C.

Theoretical and Practical Aspects of Fluorescence, Luminescence, and Phosphorescence

G. G. Taylor, J. Soc. Dyers & Colourists 66, 181-6, March, 1950.

This article supplements the one by E. C. Caspar in the same issue. It explains at considerable length, from a theoretical standpoint, the difference between fluorescence and phosphorescence, and cites various practical applications of fluorescence in both textile and nontextile fields.—W.H.C.

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20	16	24	30.00	39.00
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40	22¾	24	57.00	57.00
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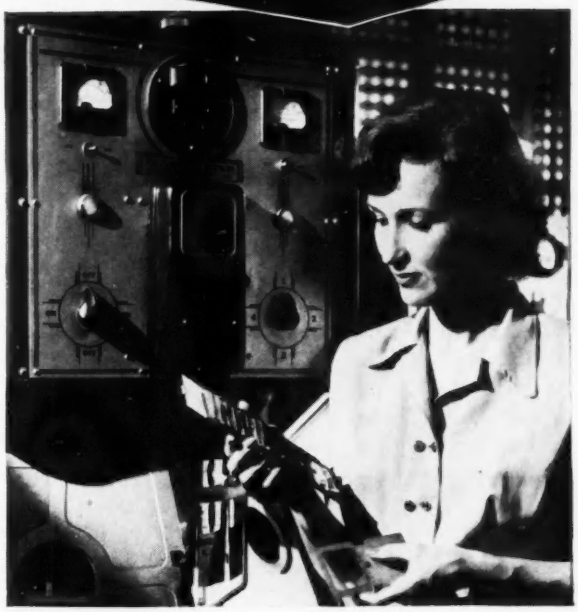

Women who use the Good Housekeeping Guaranty Seal as a guide in purchasing fabrics know that it is the distinctive mark of dependable quality. Before granting the Seal, the Good Housekeeping Textile Laboratory uses an Atlas Fade-Ometer to measure fading of colors caused by sunlight on each fabric.

In the Fade-Ometer, dyed fabrics — plastics — and a host of other products — are carefully evaluated for their resistance to the fading action of sunlight. As the source of light, the Fade-Ometer utilizes the Enclosed Violet Carbon Arc, recognized as an excellent reproduction of natural sunlight. Samples are rotated around this source, and light is highly concentrated so that the effects of sunlight are accelerated many times.

Relatively short exposure in the Fade-Ometer, therefore, is equal to months of outdoor sunlight and on the basis of test results the Textile Laboratory can safely predict whether or not the fabric will be satisfactory in actual use.

Operation of the Fade-Ometer is simple and fully automatic so that it may safely be left in continuous operation overnight. The degree of fading on each sample is measured in terms of Standard Fading Hours.

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CONFIDENTIAL EMPLOYMENT SERVICE: For Dyers, Chemists, Colorists, Managers, Superintendents and others seeking positions and for employers seeking men. Attractive positions paying splendid salaries open for capable men. Charles P. Raymond Service, Inc., 294 Washington St., Boston, Mass. Over 50 years in business.

WANTED: Salesman and demonstrator for New England territory to represent leading manufacturer of textile chemical specialties. Textile school graduate with some practical experience in the dyeing and finishing of cotton and rayon piece goods preferred. Good salary and excellent opportunity. Replies positively confidential. Our employees have been informed of this notice. Write Box No. 838.

WANTED: Chemist with practical experience in manufacturing textile chemical specialties such as synthetic detergents, resins, softeners and other finishing agents. Excellent opportunity for ambitious man. Plant located in New England. Replies will be held confidential. Write Box No. 839.

POSITION WANTED — DYESTUFF LABORATORY TECHNICIAN and COLOR MATCHER. Thoroughly experienced testing, standardizing and demonstrating dyestuffs on all fibers. Print shop and laboratory background. Write Box No. 841.

POSITION WANTED—TEXTILE PRINT COLORIST, 20 years successful experience in Screen and Roller printing on Viscose, Acetate, Silks, etc., Discharge and Application. Excellent color matcher. Complete technical knowledge. Write Box No. 842.

POSITION WANTED: Finisher for twenty-five years with nationally known plants. Experienced with all types of synthetic spun silk, nylon, and filament fabrics. Also experience with all of the types of resin finishes. Write Box No. 788.

WANTED — SALES REPRESENTATIVES: Reputable manufacturer of textile chemical specialties has two territories open for men with well established following. Requires one man for Pennsylvania and western New Jersey area, and one man for Carolinas. Unusually attractive financial arrangements available to qualified men. Write Box No. 819.

MICROBIOLOGIST-CHEMIST: Executive capacity. Specialist in prevention of deterioration, especially in textile yarns, fabrics, and chemical formulae; preservation during processing. Twenty years diversified industrial and teaching experience. Application and control testing, pilot operations, production, field promotion, research and development, laboratory and plant supervision, technical liaison. Trained in psychology and personnel problems. B.S., M.S. Age 37, married, family. Memberships in AATCC, ACS, SAB, AAAS. Desire position making good use of potential, executive or assistant. Write Box No. 844.

WANTED: Man desired to sell textile chemical specialties in established territory of Tennessee, Georgia and Alabama. Knowledge of textile processing preferable. Previous sales experience not necessary, but desirable. Write Box No. 845.

POSITION WANTED—Thoroughly experienced plant manager, dyeing, printing, finishing, box and jigg work, good executive and production planner, quality and cost conscious, thorough knowledge all equipment its purpose operation and maintenance, full understanding of trade's demands and requirements, desires connection with responsible organization. Write Box No. 846.

FOR SALE—New, unused No. 20 Charlotte Colloid Mill complete with 20 H.P., 3600 R.P.M. motor, type T-1 rotor and stator, in original crate. Will prepay to your plant, plus discount from original price. Write Box No. 847.

• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery wanted or for sale—the rate is $7.50 per column inch or less per insertion.

YOUNG MAN—Preferably under 35, having good sales personality and several years of selling, as well as practical mill experience in bleaching and dyeing, to represent chemical company as salesman and demonstrator. Good opportunity. Salary and commission. Write Box No. 848.

POSITION WANTED—Technical service or sales in dyes or dyeing equipment. Eng. and chemical education, 16 years experience as dyehouse sup't. technical and sales representative. Experienced all classes of colors, all fibres, modern practice, capable of original research and development. Write Box No. 849.

WANTED: High calibre colorist thoroughly experienced with screen printing process. Must be able to take complete charge of production. New England area. Please state qualifications. Replies confidential. Write Box No. 850.

C H I L E—Expert-Executive, AATCC member, arrived for negotiations with U. S. manufacturers interested in development of business requiring technical qualifications. Supported by leading Chilean distributing organization. Necessary technical product information in manufacturers premises can be arranged. First class references available. Write Box No. 851.

POSITION WANTED: As plant chemist or as assistant superintendent. 20 years of varied experience as plant chemist and assistant superintendent on the dyeing and printing of cotton and synthetics. Graduate of Philadelphia Textile Institute and additional engineering studies at recognized universities. Write Box No. 852.

POSITION WANTED: Dyer over 20 years experience bleaching and dyeing cotton and rayon knit goods. Best of references. Herman Lilienkamp, 408-26th Street, Union City, New Jersey.

WANTED: Dyers for second and third shifts wanted by New England Mill. Flat or knit goods experience in dyeing synthetic and natural fibers essential. Please write details regarding background and work experience to Box Number 853.

POSITION WANTED—Capable manager with dyeing experience in woven, tricot knit, and narrow fabrics desires position in dyeing or related field. College graduate. Married. Write Box No. 855.

TEXTILE CHEMIST—B.S.—Eight years background in plant, laboratory and research promotion. Major experience in laboratory application and development work on finishes and auxiliaries for yarns and fabrics of natural and synthetic fibers. Four years technical service group leadership. Proficient writer and editor. Dependable, imaginative yet highly practical. After fair sample of textile industrial opportunities, wish to re-locate in technical service and product development with well-established textile mill or chemical firm. Age 31, family. Present salary $6000. Location secondary. Write Box No. 854.

WANTED: DYER-ASSISTANT—Under 30 years of age. For small dye house on West Coast. Experienced in dyeing wool, cotton and rayon yarns. Must be willing to load kettles and weigh dyestuffs. Good future for right man. State age and qualifications, also salary expected. Confidential. Write Box No. 856.

WANTED—Old established dyestuff and chemical specialties firm has an opening for a salesman in the middle west. A man who is acquainted with the territory and has some practical chemical knowledge preferred. Our own organization knows of this ad. Write Box No. 857.

SECOND SHIFT DYER WANTED—Must have practical and educational background. Mill manufactures fine woolens and worsteds, and has modern piece dyeing, stock dyeing and package yarn dyeing equipment. Reply in writing to Anglo Fabrics Co., Inc., Webster, Mass.

REPORTER

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QUALITY UNIFORMITY and ECONOMY

Go Hand-in-Hand When You

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SOLVAY LIQUID CHLORINE

4 conveniently located producing plants insure quick, dependable delivery of Solvay Liquid Chlorine—

Hopewell, Virginia • Syracuse, New York
Baton Rouge, La. • Huntsville, Alabama

Write for Solvay Technical Bulletin No. 7 . . ."Liquid Chlorine."

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Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.

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Potassium Carbonate • Calcium Chloride • Sodium Bicarbonate
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Sodium Nitrite • Para-dichlorobenzene • Ortho-dichlorobenzene
Monochlorobenzene • Methanol • Ammonium Chloride • Formaldehyde

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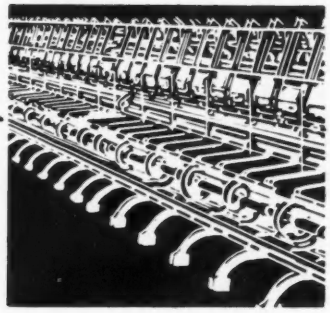

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These remarkable Laurel Hosiery Finishes assure you better lubrication and increased elasticity; speed up your processing. Yield softer, more beautiful hosiery . . . with greater freedom from snags and wrinkles. Knitters find Laurel Finishes improve their manufacturing and selling *and* their profit position. Let our Technicians arrange a test for you. Write today.

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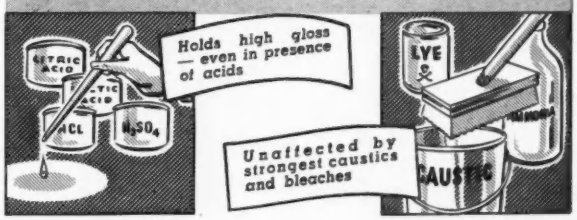
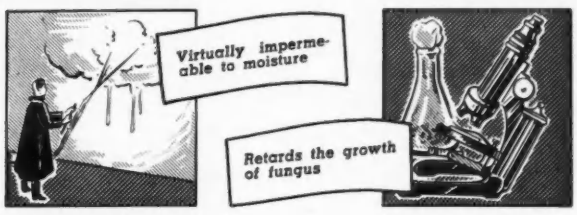
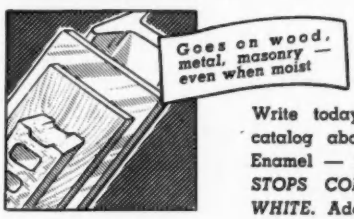
Prufcoat BX White Enamel will not yellow under either the most intense sunlight conditions or the absence of sunlight.







Write today for fully descriptive catalog about Prufcoat BX White Enamel — *The Liquid Plastic that STOPS CORROSION and STAYS WHITE.* Address: Prufcoat Laboratories, Inc., 63 Main Street, Cambridge 42, Massachusetts.

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Proof against Acids, Alkalies, Oil, Water

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ANTHOMINE added to dye bath assures uniform and solid shades when dyeing TIPPY and BLENDED WOOLS.

ANTHOMINE increases the affinity of wool fibres for dyestuffs in ALL wool dyeing operations.

This results in LEVEL SHADES when dyeing STOCK, YARN or PIECE GOODS.

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In addition to EVEN DYEING, the use of ANTHOMINE means:

Brighter, fuller shades, greater color yield

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Send for Technical Service Bulletin #203-100.2 complete information, including how to use ANTHOMINE for Top Dyeing—Pressure or Package Dyeing—Leveling Unevenly Dyed Yarn or Shady Pieces—Dyeing Metallized Colors, etc.

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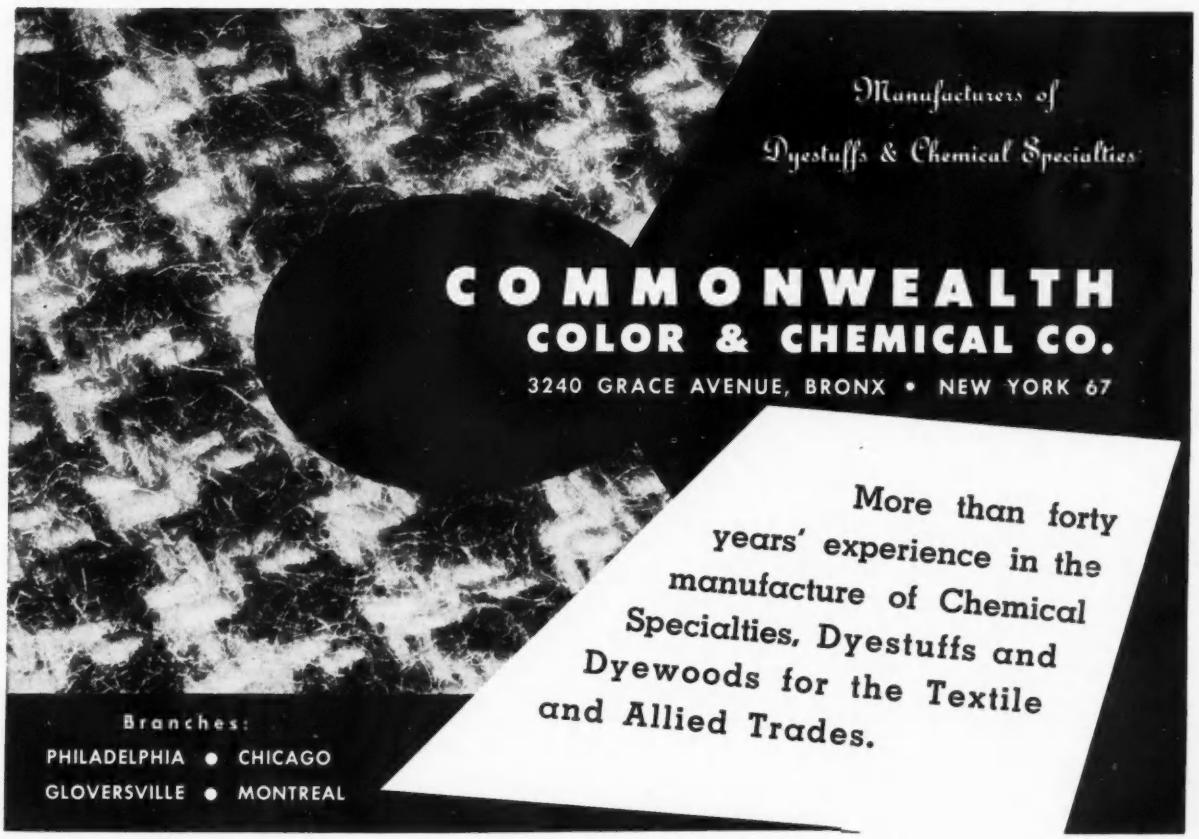
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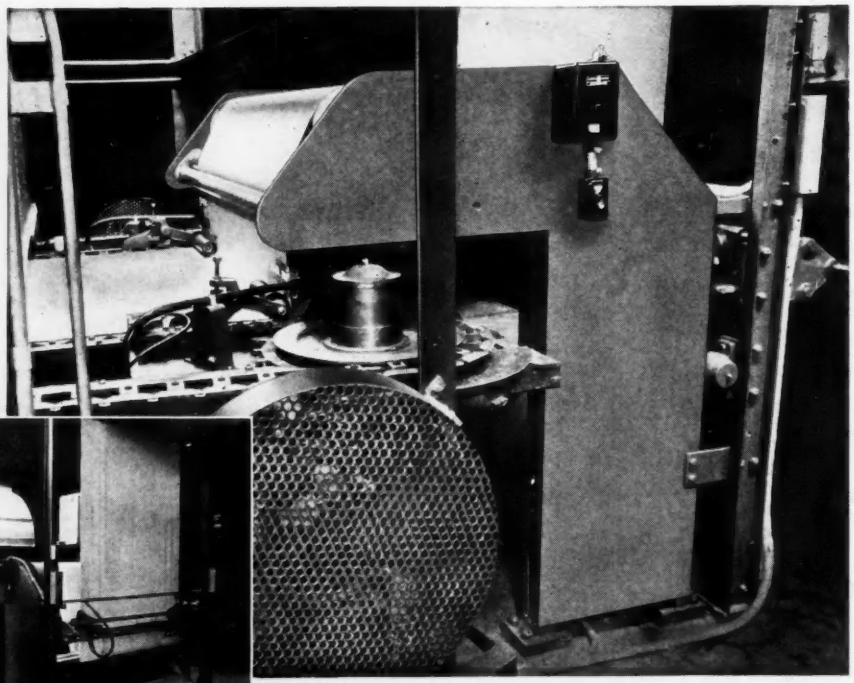
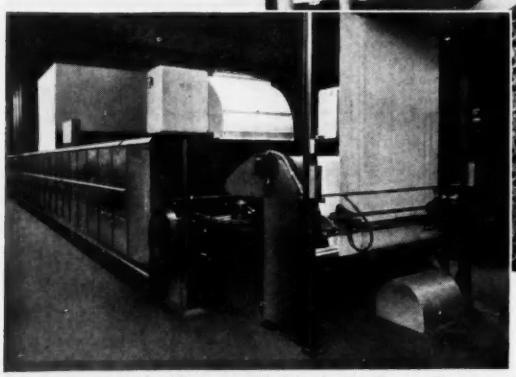
Close-up view of Ripple-Flo Overfeed Device applicable to existing straight-type tenters, either vertical or horizontal.





Entering End of Butterworth Ripple-Flo Tenter Range.

You can have RIPPLE FLO* Results

on Your Present Straight Tenter

The Butterworth RIPPLE FLO* Overfeed Device is ready to go to work on your present straight-type tenter . . . to reduce tension on fabrics during the drying process . . . to control shrinkage resulting from resin treatments . . . to improve the quality and hand of your finished goods.

By adding this remarkable new Overfeed Device, you get all the advantages of simple electric operation, accurate overfeed control and practical operating speed. And most important, it's readily adaptable to your present equipment.

Overfeed is accomplished by overdriven feed rolls ahead of the tenter brushes. A dial indicator calibrated in per cent of overfeed makes accurate setting a simple matter.

Rail guiders are actuated by a photoelectric beam on the selvage line. Electronic circuits operate instantaneously to keep tenter pin line in register with the selvage.

The Butterworth RIPPLE FLO* Overfeed Device can be used for all-purpose drying, shrinkage control, resin finishes, water repellents and permanent finishes on mixed fabrics, viscose and acetate rayon, worsteds and laces. Let us give you full details.

"MICRO-EYE" SIDE REGISTER CONTROL

Keeps selvage in proper position automatically. The signal from the scanning head is amplified and actuates a sequence of electronic circuits which, through a motor and lead screw, maintains selvage tolerance of 1/16-inch (plus or minus) in relation to the pin line.

CONTROLLED OVERFEED

Overdriven feed rolls ahead of tenter brushes are driven in conjunction with tenter drive by a patented selsyn system to give perfect coordination at all speeds. Roll overfeed is adjustable. Special brush construction picks up any selvage that comes off the pins at an irregular seam and puts it back on pin line. Facilitates piecing up when tenter is put into operation.

*Patent applied for; Registered trade name

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